



EMC[®] Ionix[™] ControlCenter[®]

6.1

Taking Control of Your Datacenter

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EMC²

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CHAPTER 1

Introduction

The Challenges

Today, many businesses face ever-increasing challenges regarding reporting on, monitoring, configuring, and controlling their datacenters.

Reporting

Businesses are finding it difficult to keep track of what they have in their datacenters. For example, they need to know the number of storage arrays they have, the storage array vendors, how the storage arrays are being used, and by which applications. The process of keeping track, gathering information from many sources, in many forms, using tools unique to each operating system, and then compiling the information onto spreadsheets, with multiple iterations, is labor-intensive and cumbersome.

Monitoring

Both large and small organizations face the challenge of monitoring their storage environment. The introduction of storage networks, while solving problems of data access, has increased datacenter complexity. Mergers and cost-conscious purchases have contributed to a heterogeneous environment, and tight budgets have prevented organizations from adding personnel. At the same time, the internet, by providing means for organizations to reach a global audience that is active day and night, has raised the standard of the levels of performance and availability.

Configuring and Controlling

Managing storage resources involves complicated, routine tasks, which can include planning changes to a datacenter and juggling multiple tools from different vendors unique to each system. Management tasks can include knowing how storage is utilized, how much free space is available and where that storage is located. Configuration tasks can include adding new servers, applications, and storage. All of these processes can be extremely complex and difficult to manage efficiently.

The Solution

The EMC Ionix ControlCenter 6.x family of storage management software provides an end-to-end solution for multivendor storage reporting, monitoring, configuration, and control. With Ionix ControlCenter, you can *see* the elements of your IT infrastructure (both hardware and software), *know* how your infrastructure is performing, and *do* what's necessary to ensure that service levels are met—for better performance, improved productivity, and reduced costs.

Use Case Scenarios

To supplement the product user documentation, EMC provides this book of *use case scenarios*. Unlike a product guide, which covers the entire range of features and capabilities, each chapter looks at just a small slice of Ionix ControlCenter functionality—that subset of Ionix ControlCenter you will use to answer specific questions such as “*How do I know what I have?*”, “*How do I monitor what I have?*”, and “*How can I control and manage what I have?*” This book assumes that Ionix ControlCenter is already installed and configured.

Each use case has a small-to-medium datacenter environment, with multiple arrays, switches, databases, and hosts. However, it has none of the complexity associated with clustering, multiple networks, or firewalls that you might have implemented in your datacenter.

Who Should Use This Use Case Scenarios Book?

This use case scenarios book serves as a model for the methods of using Ionix ControlCenter to improve your business and operational processes. It also demonstrates how Ionix ControlCenter can be used to accomplish the tasks around managing a datacenter.

CHAPTER 2

Reporting on Your Datacenter

EMC Ionix ControlCenter provides many solutions for creating detailed reports of your storage assets. Use these reports to keep track of what storage assets you have and what group or department is using them, monitoring storage capacity and utilization, planning for configuration changes to the datacenter, or identifying performance problems that can severely impact business operations.

This chapter contains the following scenarios:

- ◆ Identifying IT assets for accounting 8
- ◆ Tracking which assets belong to a department (CTO) 19
- ◆ Tracking which assets belong to a department (Operations Manager) 22
- ◆ Allocating storage for a new application 26
- ◆ Understanding how much storage is allocated to an application..... 27
- ◆ Charging departments for storage use..... 31
- ◆ Configuring database space for a new application 36
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- ◆ Identifying a host performance problem 59
- ◆ Identifying a storage array performance problem 64

Identifying IT assets for accounting

This example demonstrates how a CTO can use EMC® Ionix™ StorageScope™ to create reports of the company's IT assets, including arrays, hosts, and switches, for the corporate accountants. The CTO logs in to StorageScope, builds custom queries displaying all assets managed by Ionix ControlCenter, and prints them to a PDF. Once generated, the queries can be re-used to provide the information on demand.

The sections below demonstrate how to use StorageScope to retrieve basic information for arrays, hosts, and switches, along with some custom fields that are specific to the accounting department's needs.

Note: If you create a single query listing all arrays, hosts and switches in the environment, the StorageScope Query Builder will list the objects by logical relationship, entering one row for every logical path from host to array through a switch. In cases where an object is not connected to any other managed resource, it would not appear in the query at all. For this example, a simple, complete listing of objects is required. Consequently, the listing of managed resources is handled through three queries rather than a single query.

Listing of arrays

To complete this task, the CTO:

1. Opens a web browser window and enters the following URL:

`https://<StorageScope_host_name>:30002/srm`

 where <StorageScope_host_name> is the name of the host on which StorageScope is installed.
2. Enters the Ionix ControlCenter login. The dashboard appears.
3. On the **StorageScope** menu, selects **Analysis > Queries > Query Builder**.
4. Selects **Create** to launch the **Query Builder Wizard**.

Note: For detailed instructions on using the Query Builder Wizard, refer to the StorageScope online help.

- a. On the **Define Initial Settings** step of the wizard, sets **Name**, **Description**, and **Time Period** settings for the query, see [Figure 1 on page 9](#).

The screenshot shows the 'Define Initial Settings' step of a query builder. It is divided into two main columns. The left column contains: a 'Name' text box with 'array assets'; a 'Description' text box with 'list arrays in accounting dept'; and a 'Query Categories' section with a dropdown menu showing 'Asset Management'. The right column contains: a 'Select Time Period for Data' section with radio buttons for 'Current Data' (selected) and 'Historical Data'; a 'Date Range' section with 'From' and 'to' date pickers both set to '12/01/2009'; a 'Time Period' dropdown set to 'Last Week'; a 'Select Objects to include' dropdown set to 'Current objects only'; and a 'Select Frequency:' dropdown set to 'Daily Values (up to 42 days)'.

Figure 1 Define Initial Settings step of the Query Builder

5. Since the query will be returning data based on the present configuration of the managed environment, selects **Current Data**.
6. Clicks **Next** to move to the **Areas of Interest** page of the query wizard [Figure 2](#).

EMC StorageScope Query Builder - Areas of Interest - Microsoft Internet Explorer

2. Select one to eight related Areas of Interest

Steps: 1 > 2 > 3 > 4 > 5 > 6

Choose categories of information on which the query will return data. You can only select related areas of interest; as you select categories, unrelated categories will be de-activated.

Clear all

Hosts

☐ Hosts

☐ Chargeback

☐ Host Devices

☐ Shared Devices

☐ HBAs

☐ Ports

☐ Host Arrays

☐ Volume Groups

☐ Logical Volumes

☐ File Systems

☐ Components

☐ Groups

☐ ESX Server

☐ VM Machine

☐ VM File

Files

Connectivity

☐ Switches

☐ Ports

☐ Port Connections

☐ Fabrics

☐ Active Zone Sets

☐ Active Zone Set Members

☐ Unzoned End Ports

☐ Groups

Applications

Databases

☐ Databases

☐ Database Datafiles

Arrays

☐ Arrays

☐ LUNs

☐ Meta Devices

☐ Device Allocation

☐ Disks

☐ Ports

☐ Port Connections

☐ LUN Masking

☐ Replicas

☐ RAID Groups

☐ Storage Groups

☐ Storage Pools

☐ Groups

☐ Pools

NAS

☐ NAS Servers

< Back

Next >

Cancel

Help

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Files

- ☐ Files
- ☐ File Activities
- ☐ File Types
- ☐ Top Folders
- ☐ Owners
- ☐ Folders
- ☐ Folder Summary
- ☐ File Groups for Chargeback
- ☐ Folder Group Paths

Backup

- ☐ Backup Servers
- ☐ Clients
- ☐ Data Sets
- ☐ Job Details
- ☐ Job Errors
- ☐ Schedules

Database Datafiles

- ☐ Database Datafiles
- ☐ Oracle Tablespaces
- ☐ Oracle Parameters

Custom Fields

- ☐ Custom Fields
- ☐ Custom Field Instances

Groups

- ☐ All Objects in a Group
- ☐ All Groups

NAS Servers

- ☐ NAS Servers
- ☐ Data Movers
- ☐ NAS File Systems
- ☐ IP Interfaces
- ☐ Exports
- ☐ Server Groups
- ☐ File System Groups
- ☐ Storage Devices
- ☐ Mount Points

CAS

- ☐ Clusters
- ☐ Pools
- ☐ Storage Nodes
- ☐ Cluster Groups
- ☐ Pool Groups

< Back Next > Cancel Help

Figure 2 Areas of Interest step of the Query Builder

7. On the **Areas of Interest** page, selects **Arrays** from the **Arrays** grouping.
8. Clicks **Next** to move to the **Select Columns** page of the query wizard [Figure 3 on page 12](#).

3. Select Columns

Steps: 1 > 2 > 3 > 4 > 5 > 6

Select database columns to be used in the query; the list of available columns depends on the objects selected in the previous step. You can also set display aliases for columns and create custom, calculated columns based on existing columns.

< Back Next > Cancel Help

Figure 3 Select Columns Step of the Query Builder

9. Adds the following columns to the query:

- Arrays.Array Vendor
- Arrays.Array Type
- Arrays.Array Model
- Arrays.Array Name
- Arrays.UDF.Cost
- Arrays.UDF.Location

Note: The columns listed above containing the appellation “UDF” are Ionix ControlCenter User-Defined Fields. User-Defined Fields are custom fields created by the user and are specific to the user’s environment. UDF fields listed in this document are merely examples of custom fields a user may wish to add as attributes for managed objects in their environment, they will neither exist in your Ionix ControlCenter installation nor be shown in figures in this document. For

more information about working with User-Defined Fields, refer to the Ionix ControlCenter online help or to the *EMC Technical Note Using Custom Fields in StorageScope Queries*.

10. Clicks **Next** to go to the **Create Filters** step of the query wizard. No filters are needed for this query.
11. Clicks **Next** to go to the **Select Sorting, Grouping & Total Options** step of the query wizard.
12. Leaves the default options in place and clicks **Next** to go to the **Select Run Settings** step of the query wizard.
13. Chooses the default output options for the query and clicks **Save** to save the query.

Note: This query will likely be run again in the future; EMC recommends saving it for later use.

14. Clicks **Run Now** to run the query.

The query output lists the arrays in the managed environment [Figure 4 on page 14](#).

Query Results					
Query Name: Query 2009-01-05 14:04:28					
Run Time 2009-01-05 14:17 (GMT-05:00) View SQL Modify query					
43 rows - Page 1 of 1					
Arrays: Array Vendor	Arrays: Array Type	Arrays: Array Model	Arrays: Array Name	Arrays UDF: Cost	Arrays UDF: Location
HDS	HDS	HDS9960	40357		
HDS	HDS	USP	30208		
HDS	HDS	R600	45055		
HDS	HDS	AMS200	73012495		
EMC	Symmetrix	DMX1000S	000187400662		London
HP	StorageWorks	HSV110	50001FE150013630-EVA		
EMC	Symmetrix	1000P-M2	000187400019		
EMC	Symmetrix	DMX4-24	000190101876		Boston
IBM	ESS	800	000000022848		
HDS	HDS	HDS9970V	33038		
HP	HPXP	XP 512	30471		
EMC	Symmetrix	DMX800	000187900679		London
EMC	Symmetrix	DMX800	000187900678		London
EMC	Clarion	CX600	APM00024401348		London
EMC	Symmetrix	DMX800	000187900449		
EMC	Symmetrix	DMX800	000187900818		
IBM	ESS	800	2107-7556070-DS8000		
HP	HPXP	XP 12000	10657		
EMC	Symmetrix	1000S-M2	000187431020		London
EMC	Symmetrix	DMX1000P	000187400135		London
HP	HPXP	XP 128	20789		
EMC	Symmetrix	1000P-M2	000187431019		London
EMC	Symmetrix	3000-M2	000187880431		London
EMC	Symmetrix	DMX4-6	000190300153		Boston
EMC	Symmetrix	DMX3-6	000190300172		
EMC	Symmetrix	8130	000184600059		London
IBM	ESS	F20	000000015141		
HDS	HDS	HDS9570V	65013215		
EMC	Symmetrix	DMX3-24	000187700037		
EMC	Symmetrix	DMX4-24	000190100824		Boston
EMC	Invista		dev10000000059		
EMC	Symmetrix	DMX1000P	000187400662		London

Figure 4 Report listing all arrays

Listing of hosts

To complete this task, the CTO repeats the steps outlined under “Listing of arrays” on [page 8](#), substituting the following values:

- ◆ Areas of Interest step: Selects **Hosts** from the **Hosts** grouping
- ◆ Select Columns step: Selects the following columns:
 - Hosts.Host Type
 - Hosts.Host OS
 - Hosts.Host.Name
 - Hosts.UDF.Cost

- Hosts.UDF.Location

Note: The columns listed above containing the appellation “UDF” are Ionix ControlCenter User-Defined Fields. User-Defined Fields are custom fields created by the user and are specific to the user’s environment. UDF fields listed in this document are merely examples of custom fields a user may wish to add as attributes for managed objects in their environment, they will neither exist in your Ionix ControlCenter installation nor be shown in figures in this document. For more information about working with User-Defined Fields, refer to the Ionix ControlCenter online help or to the *EMC Technical Note Using Custom Fields in StorageScope Queries*.

When wizard steps are completed, clicks **Run Now** to run the query.

The query output lists the hosts in the managed environment [Figure 5 on page 16](#).

Query Results

Query Name: host assets
Run Time 2009-12-01 15:07 (GMT-05:00) [View SQL](#) [Modify query](#)

88 rows - Page 1 of 2

Hosts: Host OS Type	Hosts: Host OS	Hosts: Host Name	Hosts UDF: Cost	Hosts UDF: Location
VMNIX	VMware ESX 4.0.0 build-164009	lglob113		Boston
UNIX	AIX 5.3.0	VIO_Server1		London
UNIX	Linux 2.6.18	lhcu078		London
	Microsoft Windows Server 2003, Enterprise Edition (32-bit)	lglob121-61-rl		
	Microsoft Windows Server 2003, Standard Edition (32-bit)	lglob124-AgentHost-db1		
	Microsoft Windows Server 2003, Enterprise Edition (32-bit)	lglob170-61-rl		
	Microsoft Windows Server 2003, Standard Edition (32-bit)	Sybase_jy_lglob131		
	Microsoft Windows Server 2003, Enterprise Edition (32-bit)	Store-2 .176		
UNIX	Solaris 2.9	sloane		
	Microsoft Windows Server 2003, Enterprise Edition (32-bit)	CC-Agent-2 Server (Win2k3) .174		
VMNIX	VMware ESX 4.0.0 build-164009	lglob112		Boston
	Microsoft Windows Server 2003, Standard Edition (32-bit)	CC52+ Infra allin1		
Windows	Windows 2000	losat057		Boston
Windows	Windows Server 2003	lglob110		Boston
UNIX	AIX 5.3.0	losaq249		
UNIX	AIX 5.3.0	losao033		
	Microsoft Windows Server 2003, Enterprise Edition (32-bit)	lglob125-60		
	Other Linux (64-bit)	cee.lss.emc.com		
	Microsoft Windows Server 2003, Enterprise Edition (32-bit)	lglob225-rl		
	Microsoft Windows Server 2003, Enterprise Edition (32-bit)	CC60-ST5-Console .202		
	Microsoft Windows Server 2003, Standard Edition (32-bit)	lglob126-61UB5		
	Microsoft Windows Server 2003, Enterprise Edition (32-bit)			

Figure 5 Report listing all hosts

Listing of switches

To complete this task, the CTO repeats the steps outlined under “Listing of arrays” on page 8, substituting the following values:

- ◆ Areas of Interest step: Selects **Switches** from the **Connectivity** grouping
- ◆ Select Columns step: Selects the following columns:
 - Switches.Switch Vendor
 - Switches.Switch Model
 - Switches.Switch Name
 - Switches.UDF.Cost Center
 - Switches.UDF.Reference

Note: The columns listed above containing the appellation “UDF” are Ionix ControlCenter User-Defined Fields. User-Defined Fields are custom fields created by the user and are specific to the user’s environment. UDF fields listed in this document are merely examples of custom fields a user may wish to add as attributes for managed objects in their environment, and will not exist in your Ionix ControlCenter installation nor be shown in figures in this document. For more information about working with User-Defined Fields, refer to the Ionix ControlCenter online help or to the *EMC Technical Note Using Custom Fields in StorageScope Queries*.

When wizard steps are completed, clicks **Run Now** to run the query.

The query output lists the hosts in the managed environment [Figure 6 on page 18](#).

Query Results

Query Name: switch assets
Run Time 2009-12-01 15:17 (GMT-05:00) [View SQL](#) Modify query

35 rows - Page 1 of 1

Switches: Switch Vendor	Switches: Switch Model	Switches: Switch Name	Switches UDF: Cost
McDATA	ED-64	Losav221	
McDATA	ED-140M	losar105	
Brocade	UF060002929	losas244_MP7500	
McDATA	DS32-M2	losay245	
McDATA	ED-6140	losay214_ED6140M	
Brocade		LOSAO174	
Brocade	ACY0604D009	losas245_AP7600	
McDATA	ED-64	losav223	
Brocade	NJ040000430	CSE_Br3250_cab7	
McDATA	DS-32M	losar104	
McDATA	Sphereon 4500	apcon	
McDATA	DS-32M	SC_Switch	
McDATA	ED-5000	losay151_ED1032	
McDATA	ED-1032	losay139_ED1032	
Brocade	1000006069519B4F	losar098	
McDATA	ED-64	losav222	
McDATA	ES-3016	losar106	
Brocade	ACY0604D00C	losas246_AP7600	
Brocade	FB060002604	ASELAB_DS32B_40	
McDATA	ED-1032	Losay204_ED1032	
McDATA	ED-64	losam023	
McDATA	4500	losar038	
McDATA	DS-24M2	losav014	
McDATA	-	Gatekeeper_losas025	
McDATA	DS-16M	losam150	
McDATA		1000080088a07049	
Cisco	DS-C9216-K9	lglob160 (CSE-2)	
Brocade	10000060695141C1	ASELAB_DS16B2_39	
McDATA	ED-5000	losay222_ED1032	
McDATA	4500	losav025	
Cisco	DS-C9120-K9	losam250	

Figure 6 Report listing all switches

Tracking which assets belong to a department (CTO)

This example demonstrates how a CTO can use the Hosts by Group and Arrays by Group reports in EMC StorageScope to identify which hosts and arrays belong to a particular group.

Note: Grouping of objects (host, arrays, and so on) is done in the Ionix ControlCenter console. Refer to the Ionix ControlCenter online help subject *Creating user-defined groups* for details regarding creating user-defined object groups.

Displaying the hosts in a group

To display the hosts in a group, the CTO:

1. Generates the **Hosts by Group** report [Figure 7](#).

Note: Refer to [“Understanding how much storage is allocated to an application” on page 27](#) for step-by-step instructions on creating this report.

Host Name	Host OS	Accessible (GB)	Used Accessible (GB)	File System (GB)	Used File System (GB)	Network File System (GB)	VMFS Capacity (GB)	Used VMFS (GB)	Database (GB)	Used Database (GB)
Host Group: \All Groups\ASELAB\ESX Servers										
LOSBC090	VMware ESX Server 3.0.0 build-27701	4,640.80	4,050.43	0.00	0.00	0.00	4,072.29	1,435.27	0.00	0.00
LOSBD031	VMware ESX Server 3.0.0 build-27701	7,572.96	5,060.00	0.00	0.00	0.00	5,089.75	1,188.88	0.00	0.00
LOSBC168	VMware ESX Server 3.0.0 build-27701	3,460.69	3,460.50	0.00	0.00	0.00	3,521.25	1,121.85	0.00	0.00
LOSBD068	VMware ESX Server 3.0.0 build-27701	5,079.11	4,269.50	0.00	0.00	0.00	4,283.25	1,192.89	0.00	0.00
Total		8,753.07	16,840.43	0.00	0.00	0.00	16,966.55	4,938.89	0.00	0.00
Host Group: \All Groups\ASELAB\Unix Hosts										
losbd122	Linux 2.6.9	1,482.81	0.00	1,068.78	1,017.51	0.00	0.00	0.00	0.00	0.00
Total		1,482.81	0.00	1,068.78	1,017.51	0.00	0.00	0.00	0.00	0.00
Host Group: \All Groups\ASELAB\VM Guests - Linux										
LOSBC209 - RH Linux AS4	Other Linux	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Host Group: \All Groups\ASELAB\VM Guests - Windows										
LOSBC203 Clone	Microsoft Windows Server 2003, Enterprise Edition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LOSBC132 - Agent Host LOSBC197	Windows Server 2003	0.00	0.00	7.80	4.95	0.00	0.00	0.00	0.00	0.00
LOSBC130 - Agent Host LOSBC197	Windows Server 2003	0.00	0.00	7.80	6.09	0.00	0.00	0.00	0.00	0.00

Figure 7 Hosts by Group report

- Reviews the report output to determine storage usage for host groups and to find a listing of all hosts owned by one or more groups in which the CTO is interested.

Note: To prevent double-counting of storage resources shared by hosts within a group, the “Total” values in this report reflect the total storage capacity available to the group, not the sum of the storage available to each of the group’s hosts.

Displaying the arrays in a group

To complete this task, the CTO:

- Selects **Analysis > Reports > Built-in/Custom Reports** from the StorageScope navigation menu.
- Selects the checkbox corresponding to the Arrays by Group report and clicks **Run Now** to open the **Run “Arrays by Group”** dialog box.

3. Uses the **Settings** section of the dialog box to specify a **Name** and **Output Format** for the report.
4. Clicks **Get Values** to retrieve a listing of array groups in the enterprise.
5. Uses the **Filters** to select the **Array Groups** and **Group Depth(s)** for which the report will return data.
6. Clicks **Run Now** to close the dialog box and run the report with the specified settings; the **Interactive Reports** page appears.
7. Periodically refreshes the page until the report's **Status** is **Completed**.
8. Selects the name of the report from the **Job** column to view the report output [Figure 8](#).

Array Name	Array Type	Physical Capacity (GB)	Configured (GB)	Allocated (GB)	Accessible (GB)	Used Accessible (GB)	# Ports	# Hosts Accessing Arrays	# LUNs	# Accessible LUNs	# Host Devices
Array Group: All Groups\Sales											
33038	HDS	2,592.00	1,558.87	1,133.21	0.00	0.00	16	2	276	0	0
85013215	HDS	1,859.58	1,181.46	570.52	0.00	0.00	4	1	80	0	0
40357	HDS	1,152.00	854.82	100.85	0.00	0.00	16	0	322	0	0
Total		13,916.41	9,186.73	5,393.15	110.03	0.00	84	2	1,887	13	13

Figure 8 “Arrays by Group” report

9. Reviews the report output to determine storage usage for host groups and to find a listing of all hosts owned by the group(s) in which they are interested.

Tracking which assets belong to a department (Operations Manager)

This example demonstrates how an Operations Manager uses the Console tree and Topology view to identify the assets of a department, in this case Manufacturing. The task involves viewing the user-defined group in the Console tree, opening the Topology view, and then adding the user-defined group to the view. In this example, a group for the manufacturing department has already been created and populated with the objects for that group.

User-defined groups (UDGs) are created in the Ionix ControlCenter Console tree. A folder named “Manufacturing” was created and then the objects owned by that group were copied or dragged and dropped into the folder. Refer to the Ionix ControlCenter online help in the Console on how to create UDG’s, and how to add and remove objects from UDG’s.

Exploring the Manufacturing group

To complete this task, the Operations Manager:

1. Logs in to the Console.
2. In the Console tree, expands the folders **Management › Manufacturing**.
3. Expands the subfolders to see the assets that belong to Manufacturing [Figure 9](#).

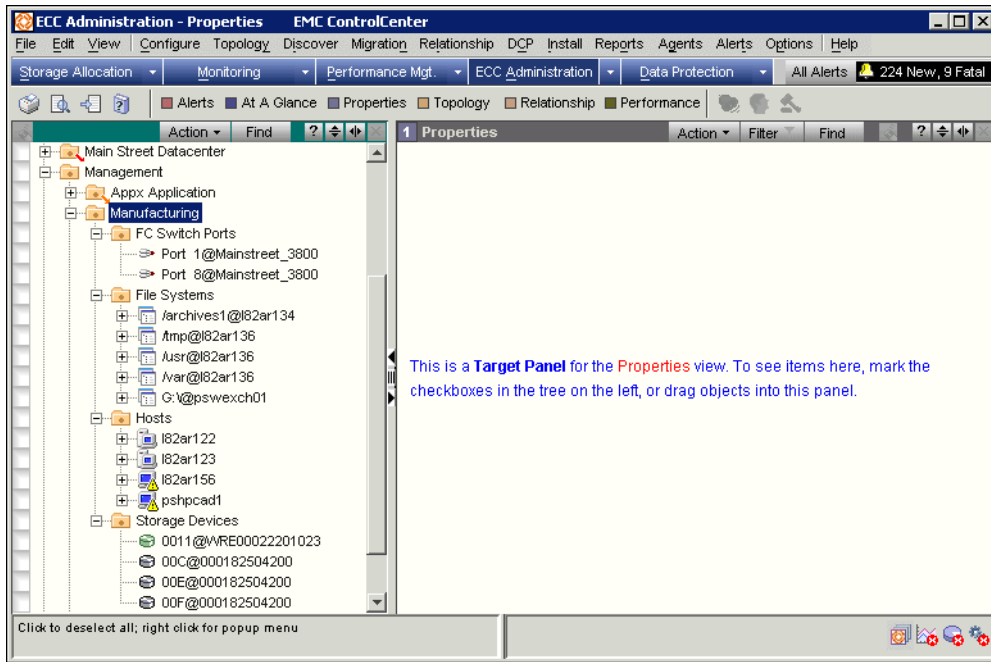


Figure 9 Viewing the assets of the Manufacturing group

The File Systems subgroup contains file systems from multiple servers. The name of the server on which a file system resides is appended to the file-system name. This convention is also used for the switch ports and storage devices.

Adding the Manufacturing group to the Topology view

The Operations Manager:

1. Clicks the **Eraser** icon in the view on the right side of the Console to clear the view.
2. On the Console toolbar, clicks the **Topology** button and displays the Topology view [Figure 10 on page 24](#).

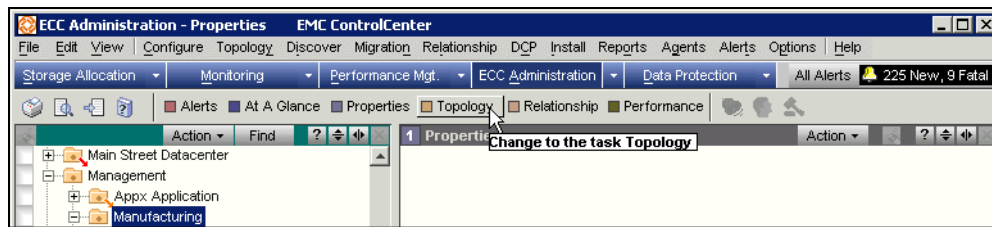


Figure 10 Displaying the Topology view

3. Drags the **Manufacturing** group folder from the Console tree to the Topology view.
4. In the Topology view, right-clicks any empty space and selects **Expand All**.
5. On the Topology view toolbar, clicks **Show Links**.

The Topology view, as depicted in [Figure 11](#), shows how the hosts in the Manufacturing group physically connect to the array devices through the fabric. In the map, the Manufacturing assets are circled.

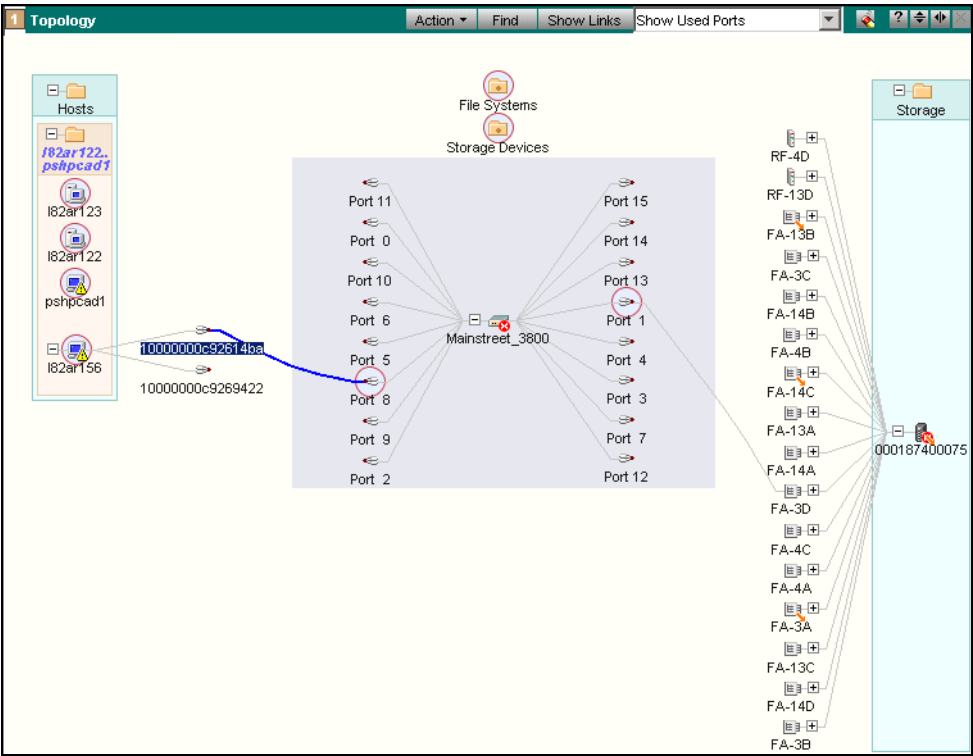


Figure 11 Viewing physical connections in the Topology view

Allocating storage for a new application

This example demonstrates how a database administrator (DBA) uses Properties views to evaluate the configuration and capacity of an existing database instance to help plan the database storage allocations for a new application.

To complete this task, the DBA:

- 1. Logs in to the Console.
- 2. In the Console tree, expands the folder **Databases Instances**, which are grouped by type.
- 3. Expands the **Oracle Instances** group, **Sales@l82ar155** instance and then **Tablespaces**.

If necessary, the administrator can click the **Eraser** icon in the view on the right side of the Console to clear the view.

- 4. On the Console toolbar, clicks the **Properties** button.
- 5. In the Console tree, places a checkmark next to the folders **Databases** and **Tablespaces**.

The properties of both database instances and the tablespaces for database Sales@l82ar155 appear in the Properties view [Figure 12](#).

The screenshot shows the 'Properties' window with two main sections: 'Oracle Instances' and 'Oracle Tablespaces'. The 'Oracle Instances' section lists two instances: 'sales' and 'testsale'. The 'Oracle Tablespaces' section lists five tablespaces: 'ROLLBACK', 'SALES', 'SYSTEM', 'TEMP', and 'UNDOTBS1'. Each tablespace entry includes details about its database instance, host, type, state, total and free space, percentage free, blocks coalesced, and total extents.

Oracle Instances			
Database Instance	Host	Version	Oracle Home
sales	av-iglob120 - Oracle10g_SQL2005_120	Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Prod	E:\Oracle\product\10.2.0\dd
testsale	av-iglob118 - Oracle10g_SQL2000_118	Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Prod	F:\oracle\product\10.2.0\dd

Oracle Tablespaces									
Tablespace	Database Instance	Host	Type	State	Total	Free	% Free	Blocks Coalesced	Total Extents
ROLLBACK	orac	av-iglob120 - Oracle10g_SQL2005_120	PERMANENT	Online	0.10 GB	0.02 GB	23	2896	3
SALES	orac	av-iglob120 - Oracle10g_SQL2005_120	PERMANENT	Online	0.39 GB	0.01 GB	3	1520	13
SYSTEM	orac	av-iglob120 - Oracle10g_SQL2005_120	PERMANENT	Online	0.48 GB	4.50 MB	1	576	2
TEMP	orac	av-iglob120 - Oracle10g_SQL2005_120	TEMPORARY	Online	0.02 GB	2.00 MB	10	0	0
UNDOTBS1	orac	av-iglob120 - Oracle10g_SQL2005_120	PERMANENT	Online	0.09 GB	0.08 GB	88	10176	10

Figure 12 Checking database configuration and capacity information

Understanding how much storage is allocated to an application

This example demonstrates how a Storage Manager uses the Hosts by Group report in EMC StorageScope to determine how much storage is accessible to “AppX”, a critical host-based, storage-intensive application.

To complete this task, the Storage Manager:

1. Accesses **StorageScope** through a web browser, see [“Identifying IT assets for accounting” on page 8](#).

The StorageScope dashboard appears.

2. Selects **Analysis > Reports > Built-in/Custom Reports**.
3. Selects the **Host by Group** report.

The Run “**Hosts by Group**” dialog box appears [Figure 13](#).

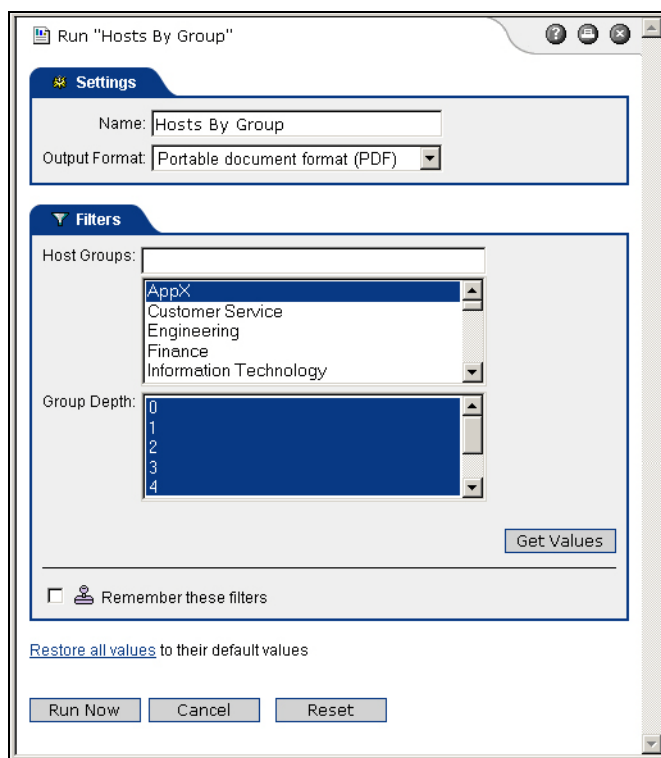


Figure 13 Hosts By Group report

4. Under **Settings**, keeps the default name of the report (Hosts By Group).
5. For **Output Format**, selects **Portable document format (PDF)** to generate the report as a PDF.
6. Under **Filters**, selects the **Host Groups** and **Group Depths** on which the report will be generated. In this example, all depths are selected.
7. Clicks **Get Values** to retrieve a list of all host groups in the environment.

Note: You can press the **Shift** and **Ctrl** keys while clicking to select multiple objects.

8. Clicks **Run Now** to generate the report [Figure 14 on page 29](#).

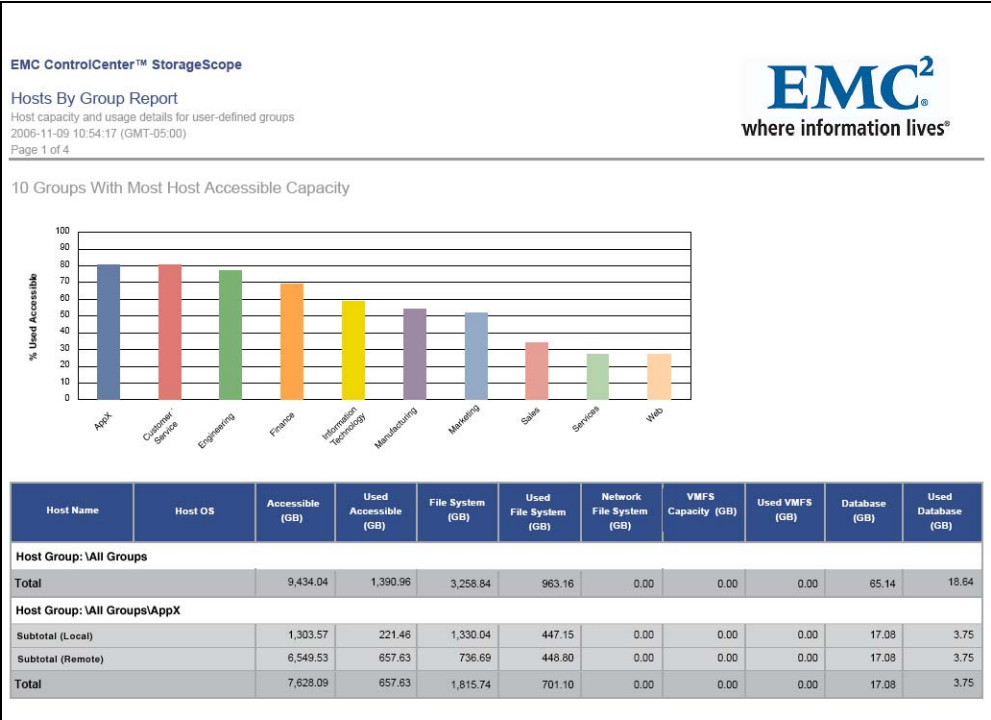


Figure 14 Hosts By Group report

9. Refreshes the Interactive Reports page periodically to check the status of the report. When StorageScope has generated the report, the **Status** appears as Complete.
10. In the **Job** column, selects the name of the report (**Hosts by Group**) to view its results.
11. The report also displays the following information for every host in the report:
 - Host Name
 - Host OS
 - Accessible (GB)
 - Used Accessible (GB)
 - File System (GB)
 - Used File System (GB)

- Network File System (GB)
 - VMFS Capacity (GB)
 - Used VMFS Capacity (GB)
 - Database (GB)
 - Used Database (GB)
12. Reviews the report to determine how much storage is available to hosts and host groups that use the application.

Note: To prevent double-counting of storage resources shared by hosts within a group, the “Total” values in this report reflect the total storage capacity available to the group, not the sum of the storage available to each of the group’s hosts.

Charging departments for storage use

The examples below demonstrates two different ways in which a CEO can track storage use by departments and charge them accordingly.

Charging departments for storage resource usage

For the purposes of this example, the enterprise's storage resources (hosts, arrays, file systems and databases) are sorted into Ionix ControlCenter user-defined groups by the departments that use them. The CTO uses StorageScope's Query Builder to determine data usage by department and, based on the results of the query, can then charge departments accordingly for their storage needs.

To build the query, the CTO:

1. Selects **Analysis > Queries > Query Builder**.
2. Selects **Create** and the **Query Builder Wizard** opens.

Note: For full documentation of the Query Builder, refer to the StorageScope online help. The procedures listed below are described in detail under [“Identifying IT assets for accounting” on page 8](#).

3. On the **Define Initial Settings** step of the wizard, chooses a **Name**, **Description**, **Category**, and **Time Period** for the query.
4. Selects the following **Areas of Interest** for the query:
 - Hosts: Chargeback
 - Groups
 - All Groups
5. On the **Select Columns** step of the Query Wizard, chooses the following columns and orders them as shown below:
 - All Groups.Group Name
 - All Groups .Group Path
 - Chargeback.# Subgroups
 - Chargeback.# Physical Hosts
 - Chargeback.# Databases

- Chargeback.# File Systems
- Chargeback.Accessible (KB)
- Chargeback.Database Capacity (KB)
- Chargeback.DB on Array (KB)
- Chargeback.File System (KB)
- Chargeback.FS on Array (KB)
- Chargeback.Internal/JBOD (KB)

Note: Refer to the StorageScope online help for full documentation of database fields used with the Query Builder.

6. In this example, no filtering is needed, so the DBA clicks **Next** to proceed to the **Select Sorting, Grouping & Total Options** step of the wizard.
7. Sorts and the results of the query in ascending order by **All Groups.Group Name**.
8. Selects **No Subtotals**.
9. Clicks **Save**; this query will likely be used again in the future.
10. Clicks **Run Now** to execute the query and display its results in screen in the format specified on the first step of the wizard.

The output of the query results lists the amount and type(s) of storage resources used by each department in the enterprise [Figure 15](#).

All Groups: Group Name	All Groups: Group Path	Chargeback: # Subgroups	Chargeback: # Physical Hosts	Chargeback: # Databases	Chargeback: # File Systems	Chargeback: Accessible (KB)	Chargeback: DB on Array (KB)	Chargeback: Database Capacity (KB)
Sales	\\All Groups\Boston\Sales\	1	2	4	12	453,623,040.00	0.00	2,902,752.00
Windows	\\All Groups\OS Types\Windows\	0	3	0	8	496,072,448.00	0.00	0.00
Tru64	\\All Groups\OS Types\Tru64\	0	1	0	3	97,843,200.00	0.00	0.00
London	\\All Groups\London\	2	7	1	46	707,344,256.00	0.00	64,528.00
CSE VMware Cluster	\\All Groups\CSE VMware Cluster\	0	2	0	0	3,694,569,600.00	0.00	0.00
VMware ESX Server	\\All Groups\OS Types\VMware ESX Server\	0	3	0	0	4,800,752,000.00	0.00	0.00
Windows MSCS	\\All Groups\OS Types\Windows MSCS\	0	2	0	6	247,184,640.00	0.00	0.00
HR	\\All Groups\London\HR\	1	4	0	30	233,718,656.00	0.00	0.00
Windows - Virtual	\\All Groups\OS Types\Windows - Virtual\	0	0	0	0	0.00	0.00	0.00
Hosts	\\All Groups\Boston\Sales\Hosts\	0	2	4	12	453,623,040.00	0.00	2,902,752.00
Database	\\All Groups\London\Sales\Database\	0	0	1	0	0.00	0.00	64,528.00
AIX	\\All Groups\OS Types\AIX\	0	3	0	19	384,296,448.00	0.00	0.00
Manufacturing	\\All Groups\Boston\Manufacturing\	1	2	0	4	429,916,160.00	0.00	0.00
Sales	\\All Groups\London\Sales\	2	3	1	16	473,625,600.00	0.00	64,528.00
Hosts	\\All Groups\London\HR\Hosts\	0	4	0	30	233,718,656.00	0.00	0.00

Figure 15 Host Chargeback report

Charging departments for file group usage

In the scenario shown below, the CTO creates a file group for chargeback for each department, and then adds the department's file systems to the group. Then, the CTO runs the chargeback report to produce an itemized listing of each department's file system storage use and chargeback amount.

Creating file groups

To create file groups, the CTO:

1. On the **Utilities** menu, selects **Settings > File Groups for Chargeback** and displays the File Groups for Chargeback page.
2. Clicks **Create** to open the **New File Group for Chargeback** dialog box.
3. Assigns the department's name to the group.

Note: Each group must have a unique name. Names can be up to 50 characters long.

4. Assigns a value or cost per unit of storage, such as \$1 per GB.

Note: The chargeback value is calculated against the amount of used capacity in the file system, not the allocated capacity of the file system.

5. Clicks **OK** to create the file group.
6. Repeats this process for every file group being created.

Adding paths to the file group

After the file group has been created, paths must be added to it by the CTO, who:

1. On the **Utilities** menu, selects **Settings > File Groups for Chargeback** and displays the **File Groups for Chargeback** page.
2. Selects the checkbox next to the file group to which paths are being added.
3. Clicks **Modify** and displays the properties page for the group.
4. Clicks **Add** to open the **Add Paths** dialog box.
5. In the **Add Paths** dialog box, uses either of the following methods to add paths:

Browses for the resource

- a. Clicks the **Browse** tab.
- b. Selects the host on which the file system resides.
- c. Drills down to find the desired file system path, selecting the checkbox next to it.
- d. Clicks **OK** to add the path.

Manually enters the path to the resource

- a. Clicks the **Specify Paths** tab.
- b. Types each path on a separate line in UNC format

For example, `\\server\share\folder` or `//server/share/dir`

6. Clicks **OK** when finished adding paths.
7. Repeats this process for the other File Groups associated with each department.

Running the Chargeback Report

This example assumes that departments are charged for storage resource usage by the amount of storage they use in network and host-based file systems. Here, the StorageScope administrator has created a File Group for Chargeback for each department, assigned a cost per unit of storage for each group, and populated each group with the file systems used by the department assigned to it.

Note: [“Creating file groups” on page 33](#) provides instructions for creating a file group.

Once this configuration process is complete, the CTO runs StorageScope’s built-in Chargeback report to assess how much to charge the department for its resource usage at the file level.

To run the Chargeback report, the CTO:

1. Selects **Analysis > Reports > Built-In/Custom Reports** from the StorageScope navigation menu to go to the **All Reports** page.
2. Selects the checkbox corresponding to the **Chargeback** report on the list of **Built-in Reports**.
3. Scrolls to the bottom of the page and clicks **Run Report**. The **Run “Chargeback” Report** dialog box appears.
4. Selects a **Name** and **Output Format** for the report.
5. Clicks **Get Values** to retrieve a list of Host Names and File Groups in the managed environment.
6. Uses the **Filters** to select one or more **Host Names, File Groups, Paths**, and a **File Size** range on which the report will be generated.
7. Clicks **Run Now** to generate the report. The dialog box will close and the browser will be redirected to the **Interactive Reports** page.

Note: The report may take several minutes to run.

8. Refreshes the **Interactive Reports** page periodically to check the status of the report.

When StorageScope has generated the report, the **Status** will be listed as “Complete.”

9. Selects the completed report’s name in the **Job** column (in this case, **Chargeback**) to view its results.

The Chargeback report displays a listing of File Groups for Chargeback in the managed environment, with subtotals by group and itemized data points for the file-level storage used by each group.

Configuring database space for a new application

This example demonstrates how a database administrator (DBA) works with a storage administrator using StorageScope to determine the capacity and configuration necessary for adding a new database application to the datacenter.

At the DBA's request, the storage administrator uses the StorageScope Databases report to get capacity and configuration information about all databases in the environment. Based on the results of that report, the storage administrator then uses the StorageScope Query Builder to determine the storage systems on which the databases reside and the available storage that has been allocated for them. With this information, the DBA can determine whether more storage needs to be allocated for the new database application.

Generating the databases report

To complete this task, the storage administrator:

1. Logs in to StorageScope as documented under [“Identifying IT assets for accounting” on page 8](#).
2. Selects **Analysis > Reports > Built-In/Custom Reports**.
3. Selects the checkbox for the **Databases** report.
4. Clicks **Run Report**. The **Run “Databases”** dialog box appears [Figure 16](#).

Run "Databases "

Settings

Name:

Output Format:

Filters

Database Name:

Database Type:

% Used Database: to

Database Capacity: byte(s) to byte(s)

Used Database: byte(s) to byte(s)

☐ Remember these filters

[Restore all values](#) to their default values

Figure 16 Databases report setup

5. Selects a **Name** and **Output Format** for the report.
6. Clicks **Get Values** to retrieve a list of Host Groups in the managed environment.
7. Uses the **Filters** to select one or more **Database Names**, and **Database Types** on which the report will be generated.

Note: To report only on databases that have used a certain percentage of their allocated capacity, are of a certain size, or are using a certain amount of storage, enter appropriate values in the **% Used Database**, **Database Capacity**, or **Used Database** fields, respectively.

8. Clicks **Run Now** to generate the report. The dialog box will close and the browser will be redirected to the **Interactive Reports** page.

Note: The report may take several minutes to run.

9. Refreshes the **Interactive Reports** page periodically to check the status of the report.

When StorageScope has generated the report, the **Status** will be listed as “Complete.”

10. Selects the completed report’s name in the **Job** column (in this case, **Databases**) to view the results.

Details For Database orcl

Database			
Database Type:		Host Name:	.118 - Oracle10g_SQL2000_118
		Host OS:	Windows Server 2003
Database Capacity (GB):		# Data Files:	12
Used Database (GB):		Data File Capacity (GB):	1.05
		Used Data File (GB):	0.93
		Log Capacity (GB):	0.17
		# Tablespaces:	6
		Tablespace Capacity (GB):	1.05
		Used Tablespace (GB):	0.93
		# Dbspaces:	0
		# File Groups:	0

Figure 17 Report listing usage for individual database

The entire databases report displays the following:

- The 10 most and least used databases
 - Usage details for all databases in the enterprise with subtotals for specific database types
 - Usage details for individual databases, see [Figure 17](#)
11. The DBA reviews the report output to check the status and configuration of databases to determine whether more storage needs to be allocated for them.

Building the custom query

To build a custom query displaying database configurations in the environment, the storage administrator:

1. Selects **Analysis > Queries > Query Builder**
2. Selects **Create** and the **Query Builder Wizard** opens.

Note: For full documentation of the Query Builder, refer to the StorageScope online help. The procedures listed below are described in detail under [“Identifying IT assets for accounting” on page 8.](#)

3. On the **Define Initial Settings** step of the wizard, chooses a **Name**, **Description**, **Category**, and **Time Period** for the query.
4. Selects the following **Areas of Interest** for the query:
 - Hosts: Hosts, Host Devices
 - Arrays: Arrays, LUNs
 - Databases: Databases, Database Datafiles, Oracle Tablespaces
5. On the **Select Columns** step of the Query Wizard, chooses the following columns and orders them as shown below:
 - Database.Database Name
 - Databases.Database Type
 - Oracle Tablespaces.Tablespace Name
 - Database Datafiles.Data File Name
 - Database Datafiles.Resides On
 - Database Datafiles.Data File Capacity (KB)
 - Database Datafiles.Used Data File (KB)
 - Hosts.Host Name
 - Host Devices.Host Device Name
 - Arrays. Array Name
 - LUNs.LUN Name

- LUNS.LUN Capacity
6. The storage administrator does not filter the report and clicks **Next** to proceed to the **Select Sorting, Grouping & Total Options** step of the wizard [Figure 18](#).

5. Select sorting, grouping & total options

Steps: 1 > 2 > 3 > 4 > 5 > 6

Choose the column(s) by which the results of the query will be sorted and grouped for subtotaling. You can optionally choose to display only summary data instead of detailed information from individual database rows. If you are generating a report that uses subtotals, you must match the order of the columns to the sorting order of the query output. If you do not set them the same way, the output will be difficult to read.

Sort Order	Column Name	Sort Type	Subtotal by
1	Databases.Database Name	Ascending	
2	Please select a column	Ascending	
3	Please select a column	Ascending	
4	Please select a column	Ascending	

No subtotals

Show summaries only

View SQLRun NowSave

< BackNext >CancelHelp

Figure 18 Sorting the query results by database Name

7. Sorts the results of the query by **Databases.Database Name**.
8. Selects **No Subtotals**.
9. Clicks **Save**.
10. Clicks **Run Now** to execute the query and display its results in screen in the format specified on the first step of the wizard.

The output of the query results shows:

- The name and type of databases in the enterprise
- The amount of physical storage used by the databases
- The host at which databases in the enterprise are located
- The amount of storage used for each datafile
- The storage system on which the datafile resides
- Information about the array on which the datafile resides, if applicable

11. The DBA and the storage administrator examine the storage configuration for the databases to determine further storage planning needs for them. [Figure 19 on page 41](#) shows the output of the query.

Note: If there are empty values in the Host Device Name, Array Name, LUN Name, and LUN Capacity (KB) fields and the Reside On column reports “unknown”, this indicates that the tablespace resides on internal or JBOD storage rather than on an array.

Databases: Database Name	Databases: Database Type	Oracle Tablespaces: Tablespace Name	Database Datafiles: Data File Name	Database Datafiles: Resides On	Database Datafiles: Data File Capacity (KB)	Database Datafiles: Used Data File (KB)	Hosts: Host Name	Host Devices: Host Device Name	Arrays: Array Name	LUNs: LUN Name	LUNs: LUN Capacity (KB)
orac	Oracle		E:\ORACLE\PRODUCT10.2.0 IORADATA\ORAC\RED003.LOG	Virtual	51,200.00	51,200.00	av-iglob120 - Oracle10g_SQL2005_120	\\.\PHYSICALDRIVE1	000190101876	E72	20,160,000.00
orcl	Oracle	EXAMPLE	F:\ORACLE\PRODUCT10.2.0 IORADATA\ORCL\EXAMPLE01.DBF	Virtual	102,400.00	79,232.00	av-iglob118 - Oracle10g_SQL2000_118	\\.\PHYSICALDRIVE2	000190101876	E6C	62,899,200.00
orcl	Oracle	SYS_AUX	F:\ORACLE\PRODUCT10.2.0 IORADATA\ORCL\SYS_AUX01.DBF	Virtual	389,120.00	376,448.00	av-iglob118 - Oracle10g_SQL2000_118	\\.\PHYSICALDRIVE2	000190101876	E6C	62,899,200.00
orcl	Oracle	SYSTEM	F:\ORACLE\PRODUCT10.2.0 IORADATA\ORCL\SYSTEM01.DBF	Virtual	501,760.00	498,112.00	av-iglob118 - Oracle10g_SQL2000_118	\\.\PHYSICALDRIVE2	000190101876	E6C	62,899,200.00
orcl	Oracle	TEMP	F:\ORACLE\PRODUCT10.2.0 IORADATA\ORCL\TEMP01.DBF	Virtual	20,480.00	5,120.00	av-iglob118 - Oracle10g_SQL2000_118	\\.\PHYSICALDRIVE2	000190101876	E6C	62,899,200.00
orcl	Oracle	UNDOTBS1	F:\ORACLE\PRODUCT10.2.0 IORADATA\ORCL\UNDOTBS01.DBF	Virtual	87,040.00	17,856.00	av-iglob118 - Oracle10g_SQL2000_118	\\.\PHYSICALDRIVE2	000190101876	E6C	62,899,200.00
orcl	Oracle	USERS	F:\ORACLE\PRODUCT10.2.0 IORADATA\ORCL\USERS01.DBF	Virtual	5,120.00	3,328.00	av-iglob118 - Oracle10g_SQL2000_118	\\.\PHYSICALDRIVE2	000190101876	E6C	62,899,200.00
orcl	Oracle		F:\ORACLE\PRODUCT10.2.0 IORADATA\ORCL\CONTROL01.CTL	Virtual	6,896.00	6,896.00	av-iglob118 - Oracle10g_SQL2000_118	\\.\PHYSICALDRIVE2	000190101876	E6C	62,899,200.00
orcl	Oracle		F:\ORACLE\PRODUCT10.2.0 IORADATA\ORCL\CONTROL02.CTL	Virtual	6,896.00	6,896.00	av-iglob118 - Oracle10g_SQL2000_118	\\.\PHYSICALDRIVE2	000190101876	E6C	62,899,200.00
orcl	Oracle		F:\ORACLE\PRODUCT10.2.0 IORADATA\ORCL\CONTROL03.CTL	Virtual	6,896.00	6,896.00	av-iglob118 - Oracle10g_SQL2000_118	\\.\PHYSICALDRIVE2	000190101876	E6C	62,899,200.00

Figure 19 Database Configuration report

Preventing application outages due to out-of-space conditions

This example demonstrates how a Windows administrator uses the Relationship view to map an application file system on a VMware virtual machine back to the array device on which it resides. Then, using the Properties views, the Windows administrator discovers how much space is available on the virtual disk, file system, and finally on the array in case the administrator needs to add more disks to the ESX Server.

Viewing the file-system-to-device relationship

To complete this task, the Windows administrator:

1. In the Console, clicks the **Eraser** icon in the right-side view to clear the view.
2. On the Console toolbar, clicks **Relationship**.

The **Relationship** view appears.

3. In the Console tree, expands the folders **Hosts**, the **Windows Hosts** category, and a virtual machine.
4. Drags the virtual machine from the Console tree to the Relationship view.

The Relationship view, depicted in [Figure 20](#), maps the virtual machine from the ESX Server and virtual disks (VMDK files) on which the virtual machine resides, through the file systems, back to the array devices.

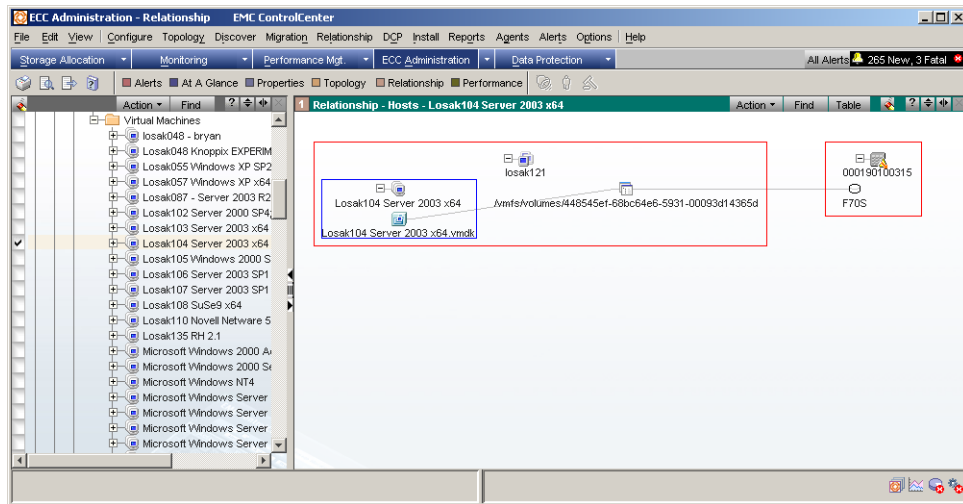


Figure 20 Relationship view

Checking the available space in the virtual disk, file system, and array

To complete this task, the Windows administrator:

1. On the Relationship view toolbar, clicks the horizontal split-screen icon [Figure 21](#).

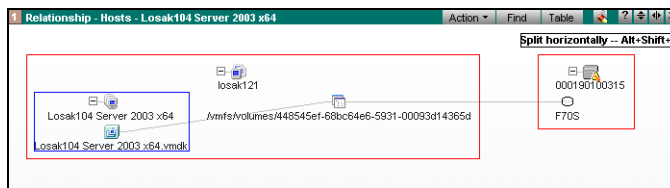


Figure 21 Splitting the Relationship view

A second, empty view appears below the Relationship view.

2. Clicks any part of the second (lower) view to make it active.
3. On the Console toolbar, clicks **Properties**.

The second view changes to a Properties view.

4. Drags the file system icon from the Relationship view to the Properties view [Figure 22](#).

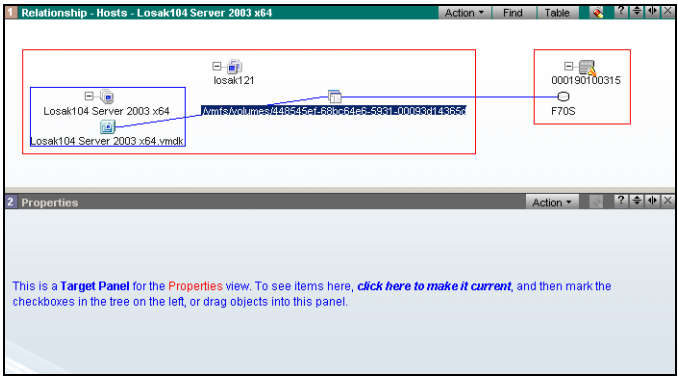


Figure 22 Dragging a file system to a Properties view

5. In the Properties view, notes the percentage of free space available in the **Percent Free** column.
6. Repeats the process by dragging the virtual disk, and then the array from the Relationship view to the Properties view.

The Properties view, depicted in Figure 23, now shows the size of the virtual disk and the amount of available space in the file system and array.

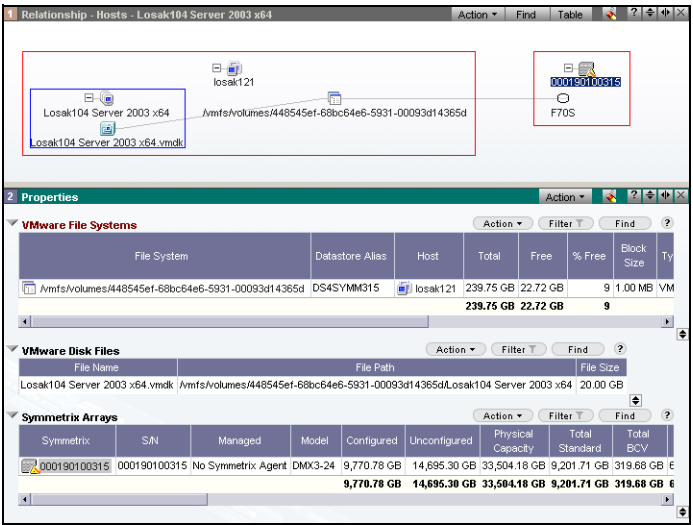


Figure 23 Viewing the available storage in a file system, virtual disk, and storage array

Predicting storage needs more accurately

This example demonstrates how a Storage Manager uses StorageScope to determine the storage needs for a file system residing on a EMC Celerra® Network Server (a NAS storage system) over time. The Storage Manager uses one of StorageScope's SRM views to get a point-in-time view of the status of NAS File Systems in the enterprise.

To complete this task, the Storage Manager:

1. Logs in to StorageScope as documented under [“Identifying IT assets for accounting” on page 8](#).
2. Selects **Analysis > SRM Views**.
3. From the **NAS** views, selects **File Systems** to open the **NAS File Systems** view.
4. Selects the **10 Most Used File Systems** layout, which displays the 10 NAS file systems that have used the highest percentage of their allocated storage space [Figure 24](#).

NAS File Systems									
File System Name	NAS Server Name	Data Mover Name	File System Type	File System (GB)	Free File System (GB)	% Used File System	NAS Snapshot (GB)	# Weeks Until Full	
/vol1vol1f1	0084170901 (NetApp - FAS250)	NASServer_hscna01	WAFL	286.83	47.33	84%	71.71	Not Available	
iscsi_db3	172.23.142.152 (Celerra - NS700 - Hammerhead)	server_2	uxfs	9.85	1.81	82%		Not Available	
zolla2	172.23.142.152 (Celerra - NS700 - Hammerhead)	server_2	uxfs	0.00	0.00	57%		Not Available	
DHSM_fs6	172.23.142.152 (Celerra - NS700 - Hammerhead)	server_2	uxfs	38.50	16.73	57%		Not Available	
DHSM_fs2	172.23.142.152 (Celerra - NS700 - Hammerhead)	server_2	uxfs	19.69	9.68	51%		Not Available	
s2fs1	172.23.141.93 (Celerra - CNS)	server_2	uxfs	107.72	54.92	49%		Not Available	
iscsi_db1	172.23.142.152 (Celerra - NS700 - Hammerhead)	server_2	uxfs	9.85	5.54	44%		Not Available	
iscsi_db2	172.23.142.152 (Celerra - NS700 - Hammerhead)	server_2	uxfs	9.85	5.59	43%		Not Available	
DHSM_fs4	172.23.142.152 (Celerra - NS700 - Hammerhead)	server_2	uxfs	29.31	17.10	42%		Not Available	
DHSM_fs3	172.23.142.152 (Celerra - NS700 - Hammerhead)	server_2	uxfs	19.69	11.58	41%		Not Available	

Figure 24 Report listing the 10 most used NAS file systems

The view displays the percentage of storage space used and the number of weeks, based on usage trends, until the storage space will be completely used.

Pooling storage resources

This example demonstrates how an Operations Manager uses StorageScope to identify unused storage space in the datacenter. The Operations Manager uses the Utilization Summary layout of the All Hosts report.

To complete this task, the Operations Manager:

1. Logs in to StorageScope as documented under [“Identifying IT assets for accounting” on page 8](#).
2. Selects **Analysis > Reports > Built-In/Custom Reports**.
3. Selects the **Hosts** report to open the **Run “Hosts” Report** dialog box [Figure 25](#).

Run "Hosts "

Settings

Name: Hosts

Output Format: Portable document format (PDF)

Filters

Host Type: Physical

Host Names:

- LOSAK106
- losak121
- LOSAN075
- losan199
- losar117

Host OS:

- HP-UX B.11.11
- VMware ESX Server 3.0.0 build-27701
- VMware ESX Server 3.0.1 build-32039
- Windows 2000
- Windows Server 2003

Accessible: [] byte(s) to [] byte(s)

% Used File System: [] to []

% Used Database: [] to []

Dormant Files: [] byte(s) to [] byte(s)

Aged Files: [] byte(s) to [] byte(s)

Aged and Dormant Files: [] byte(s) to [] byte(s)

Get Values

☐ Remember these filters

Figure 25 Hosts report setup

4. Uses the **Settings** section of the dialog box to enter a **Name** and choose an **Output Format** for the report.
5. *Optional:* Uses the **Filters** section of the dialog box to specify the **Host Type**, **host names**, and **Host OS** on which the report will return data. Also, specifies filters for a range of **Accessible** storage on the host, **% Used File System**, **% Used Database**, **Dormant Files**, **Aged Files**, and **Aged and Dormant Files**.
6. Selects **Get Values** to retrieve the list of hosts meeting the specified filter requirements.
7. If necessary, repeats the previous two steps.
8. Clicks **Run Now** to generate the report; the browser is redirected to the **Interactive Reports** page.

Note: The report may take several minutes to run.

9. Refresh the **Interactive Reports** page periodically to check the status of the report. When StorageScope has generated the report, the Status will be listed as **Complete**.
10. Selects the completed report's name in the **Job** column (in this case, **Hosts**) to view its results [Figure 26](#).

Details For All Hosts			
All Hosts			
Total # Physical Hosts: 22		# ESX Servers: 4	
Accessible (TB):	10.63	# Aged Files:	0
Accessible - Physical (TB):	5.53	Aged Files (GB):	0.00
Accessible - Thin Devices (TB):	0.20	# Dormant Files:	0
Used Accessible (TB):	4.04	Dormant Files (GB):	0.00
Internal/JBOD (TB):	4.24	# Aged and Dormant Files:	0
# Volume Groups:	13	Aged and Dormant Files (GB):	0.00
Volume Group (GB):	4,016.31	# Temporary Files:	0
Used Volume Group (GB):	1,205.65	Temporary Files (GB):	0.00
# File Systems (excl VMFS):	74	# Databases:	1
File System (excl VMFS) (GB):	1,039.82	Database (GB):	0.06
Used File System (excl VMFS) (GB):	583.34	Used Database (GB):	0.06
# Media Files:	0	# Folders/Directories:	25,311
Media Files (GB):	0.00	Folder/Directory (GB):	237.48
		# Files:	258,594
# Virtual Machines:	41	Network File System (GB):	0.00
# VMFS Volumes:	16	Raw Disk/RDM (GB):	196.88
VMFS Capacity (GB):	4,458.25	VM Snapshot (MB):	22,068.73
Used VMFS (GB):	3,070.69	VMDK Capacity (GB):	803.62

Figure 26 All Hosts report

The report in [Figure 26 on page 48](#) displays the following:

- Array storage and internal or JBOD storage accessible to each host.
- Accessible storage used by each host.
- Storage used by databases, media files, temporary files, aged/dormant files, volume groups, and file systems on each host.

Summary information for all hosts in the environment and for specific host types (for example, Windows 2003 or VMware servers), displaying the same information as described above.

11. Reviews the results of the report to determine whether there is significant unused host-accessible storage in the environment, and how that storage is allocated.

Collecting utilization statistics for management

This example demonstrates how a system administrator and DBA use StorageScope to quickly gather file-system utilization statistics for management.

The examples below demonstrate how a DBA can gather file system and database utilization statistics for management using the StorageScope Query Builder.

Collecting file system utilization statistics

In this example, the DBA quickly gathers file-system utilization statistics for management:

To complete this task, the administrator:

1. Logs in to StorageScope as documented under [“Identifying IT assets for accounting” on page 8](#).
2. Selects **Analysis > Queries > Query Builder**.
3. Clicks **Create** to create a new, custom query.
4. On the **Define Initial Settings** step of the wizard, sets **Name**, **Description**, and **Time Period** settings for the query. Since the query will be returning data based on the present configuration of the managed environment, selects **Current Data**.
5. Selects **Hosts** and **File Systems** from the **Hosts** grouping on the **Areas of Interest** step of the wizard.
6. On the **Select Columns** step, selects the following columns in order:
 - Hosts.Host Name
 - File Systems.File System Name
 - Hosts.Host OS
 - Hosts.Host OS Level
 - File Systems.File System Type
 - File Systems.Resides On
 - File Systems.File System (KB)
 - File Systems.Used File System (KB)
 - File Systems.Free File System (KB)

7. If desired, filter the query output to include or exclude certain values.
8. On the **Select sorting, grouping & total options** step of the query, sorts the query results in ascending order by **Hosts.Host Name** and selects **No Subtotals**.
9. Clicks **Save**.
10. Clicks **Run Now** to run the query.

The query output provides total and used file space information for all systems in the managed environment [Figure 27 on page 51](#).

Host Name	File System Name	Host OS	Host OS Level	File System Type	Resides On	File System (KB)	Used File System (KB)	Free File System (KB)
losbd192	/boot	Linux 2.4.21	2.4.21-15.ELsmp #1 SMP Thu Apr 22 00:16:24 EDT 2004	EXT3	Internal	101,089	42,504	58,585
losbd122	/boot	Linux 2.6.9	2.6.9-34.ELsmp #1 SMP Fri Feb 24 16:54:53 EST 2006	EXT3	Internal	101,086	18,084	83,002
losbd192	/home	Linux 2.4.21	2.4.21-15.ELsmp #1 SMP Thu Apr 22 00:16:24 EDT 2004	EXT3	Internal	18,271,560	5,092,524	13,179,036
losbd122	/home/users	Linux 2.6.9	2.6.9-34.ELsmp #1 SMP Fri Feb 24 16:54:53 EST 2006	EXT3	Unknown	1,056,894,132	1,056,894,132	0
losbd192	/opt	Linux 2.4.21	2.4.21-15.ELsmp #1 SMP Thu Apr 22 00:16:24 EDT 2004	EXT3	Internal	2,016,016	464,184	1,551,832
LOSBD031	100GB_2_SYMMETA	VMware ESX Server 3.0.0 build-27701	Build 27701	VMFS	Array	105,906,176	642,048	105,264,128
LOSBD031	100GB_3_SYMMETA	VMware ESX Server 3.0.0 build-27701	Build 27701	VMFS	Array	105,906,176	642,048	105,264,128
LOSBD031	100GB_4_SYMMETA	VMware ESX Server 3.0.0 build-27701	Build 27701	VMFS	Array	105,906,176	642,048	105,264,128
LOSBD031	100GB_5_SYMMETA	VMware ESX Server 3.0.0 build-27701	Build 27701	VMFS	Array	105,906,176	9,031,680	96,874,496
LOSBD031	100GB_6_SYMMETA	VMware ESX Server 3.0.0 build-27701	Build 27701	VMFS	Array	105,906,176	642,048	105,264,128
LOSBD031	100GB_7_SYMMETA	VMware ESX Server 3.0.0 build-27701	Build 27701	VMFS	Array	105,906,176	642,048	105,264,128
LOSBC132 - Agent Host LOSBC197	C:\	Windows Server 2003	Service Pack 1	NTFS	Virtual	8,177,052	5,196,060	2,980,992
LOSBC130 - Agent Host LOSBC197	C:\	Windows Server 2003	Service Pack 1	NTFS	Virtual	8,177,052	5,946,292	2,230,760

Figure 27 File system utilization statistics

Collecting database utilization statistics

In this example, the DBA generates a custom query to quickly gather tablespace usage statistics about the databases in the managed environment.

To complete this task, the administrator:

1. Logs in to **StorageScope** as documented under [“Identifying IT assets for accounting” on page 8](#).
2. Selects **Analysis > Queries > Query Builder**.
3. Selects the **Database Tablespace Usage** built-in query and clicks **Run**

The output of the Database Tablespace Usage query provides a listing of total, used, and available space for databases in the managed environment [Figure 28 on page 52](#).

Query Results

Query Name: Database Tablespace Usage

Run Time 2009-01-05 17:04 (GMT-05:00)

[View SQL](#)

36 rows - Page 1 of 1

Databases: Database Name ¹	Databases: Database Type	Databases: Database Version	Oracle Tablespace: Tablespace Name ²	Oracle Tablespace: Tablespace Size (KB)	Oracle Tablespace: Used Tablespace (KB)	% Tablespace Used
db2inst1	Db2	8.2.0	SYSCATSPACE	21,808.00	21,808.00	100.00
Subtotal (1)	db2inst1		SYSCATSPACE	21,808.00	21,808.00	100.00
db2inst1	Db2	8.2.0	SYSTOOLSPACE	356.00	356.00	100.00
Subtotal (1)	db2inst1		SYSTOOLSPACE	356.00	356.00	100.00
db2inst1	Db2	8.2.0	TEMPSPACE1	4.00	4.00	100.00
Subtotal (1)	db2inst1		TEMPSPACE1	4.00	4.00	100.00
db2inst1	Db2	8.2.0	USERSPACE1	4.00	4.00	100.00
Subtotal (1)	db2inst1		USERSPACE1	4.00	4.00	100.00
Subtotal (4)	db2inst1			22,172.00	22,172.00	400.00
orac	Oracle	Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Prod	EXAMPLE	102,400.00	79,232.00	77.38
Subtotal (1)	orac		EXAMPLE	102,400.00	79,232.00	77.38
orac	Oracle	Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Prod	SYSAUX	409,600.00	397,440.00	97.03
Subtotal (1)	orac		SYSAUX	409,600.00	397,440.00	97.03
orac	Oracle	Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Prod	SYSTEM	501,760.00	497,152.00	99.08
Subtotal (1)	orac		SYSTEM	501,760.00	497,152.00	99.08

Figure 28 Database tablespace usage query

Identifying old and large files

In this example, the storage administrator wants reduce wasted storage contained in file systems and hosts in the enterprise. Using the StorageScope Query builder, the administrator identifies old and dormant files, as well as large files that may be taking up valuable storage space.

Identifying old or rarely used files

The storage administrator uses StorageScope to create a query statistics about hosts containing uncompressed files that are rarely accessed or modified. In this example, the query searches for files that have not been modified or accessed since July 1, 2006.

To accomplish this task, the administrator:

1. Logs into StorageScope as documented under [“Identifying IT assets for accounting” on page 8](#).
2. Selects **Analysis, Queries, Query Builder**.
3. Clicks **Create** to create a new, custom query.
4. On the **Define Initial Settings** step of the wizard, sets **Name**, **Description**, and **Time Period** settings for the query. Since the query will be returning data based on the present configuration of the managed environment, the DBA selects **Current Data**.
5. Clicks **Next** to move to the **Areas of Interest** page of the query wizard.
6. On the **Areas of Interest** step of the wizard, selects **Hosts** and **File Systems** from the **Hosts** grouping and select **Files** and **File Types** from the **Files** grouping.
7. Clicks **Next**.
8. On the **Select Columns** step of the wizard, selects the following columns:
 - Hosts.Host Name
 - Files.Parent Directory
 - Files.File Name
 - Files.Date Created
 - Files.Last Modified
 - Files.Last Accessed

- Files.Compressed
9. Clicks **Next** to go to the **Create Filters** step of the wizard.
 10. Filters the query [Figure 29 on page 54](#).

	Column Name	Operator	Value	
(Files.Last Accessed	before	07/01/2006	
and	Files.Last Modified	before	07/01/2006)
	Select a column			
	Select a column			
	Select a column			

Figure 29 Filtering the old files query

11. Clicks **Next** to go to the **Select Sorting, Grouping & Total Options** page of the wizard.
12. Sorts the results of the query by the **Hosts.Host Name** and **Files.Last Accessed** fields in ascending order and selects **No subtotals** [Figure 30](#).

Sort Order	Column Name	Sort Type	Subtotal by
1	Hosts.Host Name	Ascending	<input type="radio"/>
2	Files.Last Accessed	Ascending	<input type="radio"/>
3	Please select a column	Ascending	<input type="radio"/>
4	Please select a column	Ascending	<input type="radio"/>
			No subtotals <input checked="" type="radio"/>

Figure 30 Sorting the columns in the old files report

13. Clicks **Next** to go to the **Select Run Settings** step.
14. Clicks **Save** to save the query as configured.
15. Clicks **Run Now** to run the query.

The query in [Figure 31 on page 55](#) shows a listing, sorted by hostname, of those files in the enterprise that have not been accessed or modified since July 1, 2006. Based on the results of the query, the storage administrator can determine which files should be compressed, archived, or deleted in accordance with the enterprise's data-retention policies.

Hosts: Host Name ▲1	Files: Parent Directory	Files: File Name	Files: Date Created	Files: Last Modified	Files: Last Accessed ▲2	Files: Compressed?
LOSAK106	C:\WINDOWS\SoftwareDistribution\WebSetup\	wusetup.cat	2005-05-26 03:27	2005-05-26 03:27	2005-05-26 03:27	0
LOSAK106	C:\WINDOWS\SoftwareDistribution\SelfUpdate\Default\	wusetup.cat	2005-05-26 04:27	2005-05-26 04:27	2005-05-26 04:27	0
LOSAK106	C:\WINDOWS\SoftwareDistribution\Download\ba366b6d1860dd5aabcee6bc8bed6d37\sp1qfe\	srv.sys	2006-04-26 21:41	2006-04-26 21:41	2006-04-26 21:41	0
LOSAK106	C:\WINDOWS\SoftwareDistribution\Download\ba366b6d1860dd5aabcee6bc8bed6d37\sp1gdr\	srv.sys	2006-04-27 16:17	2006-04-27 16:17	2006-04-27 16:17	0
LOSAK106	C:\WINDOWS\system32\	msacm32.drv	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:08	0
LOSAK106	C:\WINDOWS\inf\	mplayer2.inf	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:08	0
LOSAK106	C:\WINDOWS\system32\	ieuiinit.inf	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:08	0
LOSAK106	C:\WINDOWS\Media\	chord.wav	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:08	0
LOSAK106	C:\WINDOWS\system32\	net.hlp	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:08	0
LOSAK106	C:\WINDOWS\system32\	more.com	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:08	0
LOSAK106	C:\WINDOWS\inf\	61883.inf	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:09	0
LOSAK106	C:\WINDOWS\inf\	1394.inf	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:09	0
LOSAK106	C:\WINDOWS\inf\	accessor.inf	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:09	0
LOSAK106	C:\WINDOWS\system32\mui\dispspec\	409.csv	2005-11-30 07:00	2005-11-30 07:00	2006-05-25 01:09	0

Figure 31 Report listing all old and unused files

Identifying large files

The storage administrator seeks to identify large files in the storage network that could be wasting valuable storage space and could possibly be archived, compressed, or deleted. In accordance with the enterprise's policies, all files larger than 250 MB are subject to inspection for this purpose.

To complete this task, the storage administrator:

1. Logs in to **StorageScope** as documented under [“Identifying IT assets for accounting” on page 8](#).
2. Selects **Analysis > Queries > Query Builder**.
3. Clicks **Create** to create a new, custom query.
4. On the **Define Initial Settings** step of the wizard, sets **Name**, **Description**, and **Time Period** settings for the query. Since the query will be returning data based on the present configuration of the managed environment, the DBA selects **Current Data**.
5. Clicks **Next** to move to the **Areas of Interest** page of the query wizard.
6. On the **Areas of Interest** step of the wizard, selects **Hosts** from the **Hosts** grouping and selects **Files** from the **Files** grouping.
7. Clicks **Next** to move to the **Select Columns** page of the wizard.
8. Selects, in order, the following columns:
 - Hosts.Host Name
 - Files.Parent Directory
 - Files.File Name
 - Files.Actual Size
 - Files.Compressed?
9. Clicks **Next** to go to the **Create Filters** step of the wizard.
10. Filters the query so that it only includes files that are 250 MB or larger [Figure 32](#).

	Column Name	Operator	Value	
<input type="button" value="X"/>	<input type="text" value="Files.Actual Size (B)"/>	<input "="" type="text" value=">="/>	<input type="text" value="250000000"/>	<input type="button" value="OK"/> <input type="button" value="Cancel"/>
<input type="button" value="X"/>	<input type="text" value="Select a column"/>	<input type="text"/>	<input type="text"/>	<input type="button" value="OK"/> <input type="button" value="Cancel"/>
<input type="button" value="X"/>	<input type="text" value="Select a column"/>	<input type="text"/>	<input type="text"/>	<input type="button" value="OK"/> <input type="button" value="Cancel"/>
<input type="button" value="X"/>	<input type="text" value="Select a column"/>	<input type="text"/>	<input type="text"/>	<input type="button" value="OK"/> <input type="button" value="Cancel"/>
<input type="button" value="X"/>	<input type="text" value="Select a column"/>	<input type="text"/>	<input type="text"/>	<input type="button" value="OK"/> <input type="button" value="Cancel"/>

Figure 32 Filtering the large files query

- 11. Clicks **Next** to go to the **Select Sorting, Grouping & Total Options** step.
- 12. Sorts the query by **Hosts.Host Name** in ascending order, and then by **Files.Actual Size (B)** in descending [Figure 33](#).

Sort Order	Column Name	Sort Type	Subtotal by
1	<input type="text" value="Hosts.Host Name"/>	<input type="text" value="Ascending"/>	<input type="radio"/>
2	<input type="text" value="Files.Actual Size (B)"/>	<input type="text" value="Descending"/>	<input type="radio"/>
3	<input type="text" value="Please select a column"/>	<input type="text" value="Ascending"/>	<input type="radio"/>
4	<input type="text" value="Please select a column"/>	<input type="text" value="Ascending"/>	<input type="radio"/>
			No subtotals <input type="radio"/>

Figure 33 Sorting the columns in the large files report

- 13. Clicks **Save** to save the query for future use.
 - 14. Clicks **Run Now** to run the query.
- The output of the query shows a listing of files, sorted by host, that are larger than 250 MB [Figure 34 on page 58](#).

Hosts: Host Name ↗1	Files: Parent Directory	Files: File Name	Files: Actual Size (B) ↗2	Files: Compressed?
losat054	F:\Backup database from losan205\	repbackup.zip	1,562,304,866	0
losat054	C:\	pagefile.sys	1,006,632,960	0
losat054	D:\GHOSTS\	CLEAN.GHO	908,556,412	0
losat054	F:\	symdebug.002	734,003,200	0
losat054	F:\	symdebug.003	734,003,200	0
losat054	F:\	symdebug.005	734,003,200	0
losat054	F:\	symdebug.001	734,003,200	0
losat054	F:\	symdebug.004	734,003,200	0
losat054	F:\	symdebug.006	624,955,779	0
losat054	F:\Backup database from losan205 Repository\oradata\rambdb\	UNDOTBS01.DBF	540,024,832	0
losat054	F:\Backup database from losan205 Repository_clear\oradata\rambdb\	UNDOTBS01.DBF	524,296,192	0
losat054	F:\Backup database from losan205 Repository_clear\oradata\rambdb\	SYSTEM01.DBF	524,296,192	0
losat054	F:\Backup database from losan205 Repository\oradata\rambdb\	SYSTEM01.DBF	524,296,192	0
losat054	F:\Backup database from losan205 Repository\oradata\rambdb\	RAMB_DATA01.DBF	266,149,888	0
losba044	C:\	pagefile.sys	2,145,386,496	0
losba044	C:\ECC\Repository\oradata\emcstsd\	SRM_IDX2_01.DBF	524,296,192	0
losba044	C:\ECC\Repository\oradata\emcstsd\	SYSTEM01.DBF	524,296,192	0
losba044	C:\ECC\Repository\oradata\rambdb\	SYSTEM01.DBF	503,324,672	0
losba044	C:\ECC\Repository\oradata\emcstsd\	SRM_SCANDATA_01.DBF	262,152,192	0
losba059	C:\	pagefile.sys	2,145,386,496	0
losba059	C:\oracle\product\10.1.0\oradata\win059\	SYSTEM01.DBF	471,867,392	0
losba059	C:\oracle\product\10.1.0\oradata\win059\	SYS_AUX01.DBF	377,495,552	0

Figure 34 Report listing all large files

- Reviews the report to determine which files could be archived, deleted, or compressed in accordance with the enterprise's data-retention policies.

Identifying a host performance problem

This example demonstrates how a UNIX administrator and DBA use Performance Manager to identify a host performance problem. In this example, a company's sales department noticed that sales transactions were processing slower than normal during the day on 3/30/06 and in the morning and afternoon on 3/31/06. They informed the CTO.

The sales transactions are handled by an Oracle database that resides on host l82ar156. Host l82ar156 is connected to EMC Symmetrix® storage array 000187400075. The CTO contacts the Oracle database administrator (DBA) who works with one of the UNIX administrators to investigate the problems.

The administrator launches the Performance Manager Console and then opens the Repository that contains the performance data collected on 3/30/06 to see why the sales department noticed performance problems with the Oracle database on this day.

To complete this task, the UNIX administrator:

1. In the Ionix ControlCenter Console, on the **File** menu, selects **Launch > Performance Manager**.

The **Performance Manager** login screen appears [Figure 35](#).

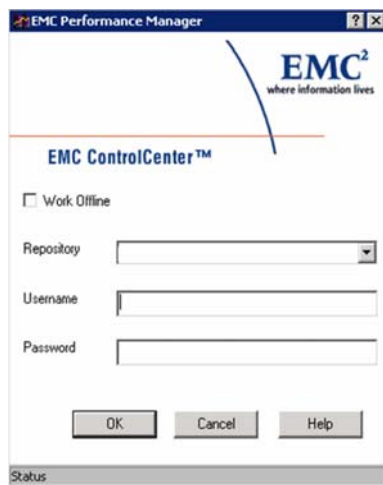


Figure 35 Performance Manager login screen

2. Selects Repository **losbd200**, the Repository holding the 3/30/06 performance data.
3. Enters the appropriate **Username** and **Password**.
4. Clicks **OK**.

The **Data Selection** dialog box appears [Figure 36 on page 60](#).

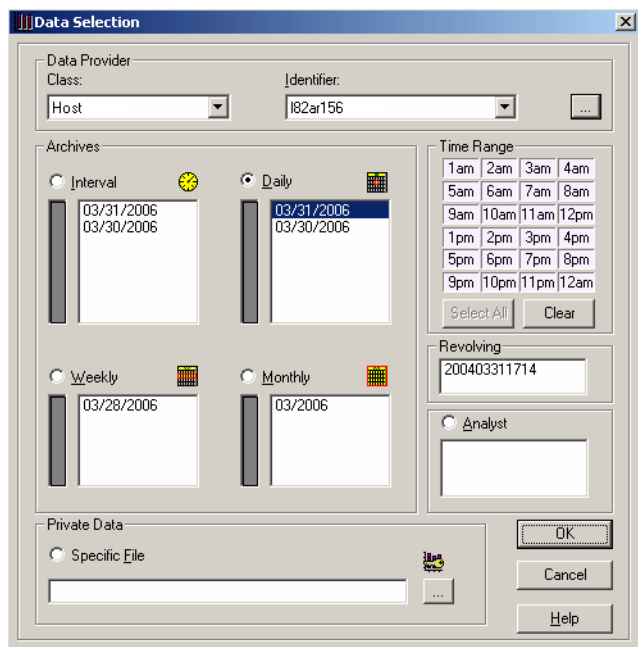


Figure 36 Data Selection dialog box

5. Under **Data Provider**, from the **Class** pull-down menu, selects **Host**.
6. From the **Identifier** pull-down menu, selects host **l82ar156**.
7. Under **Archives**, selects **Daily**.
8. Under **Daily**, selects **3/30/06**.
9. Clicks **OK**.

The **Performance Manager** Console appears [Figure 37 on page 61](#).

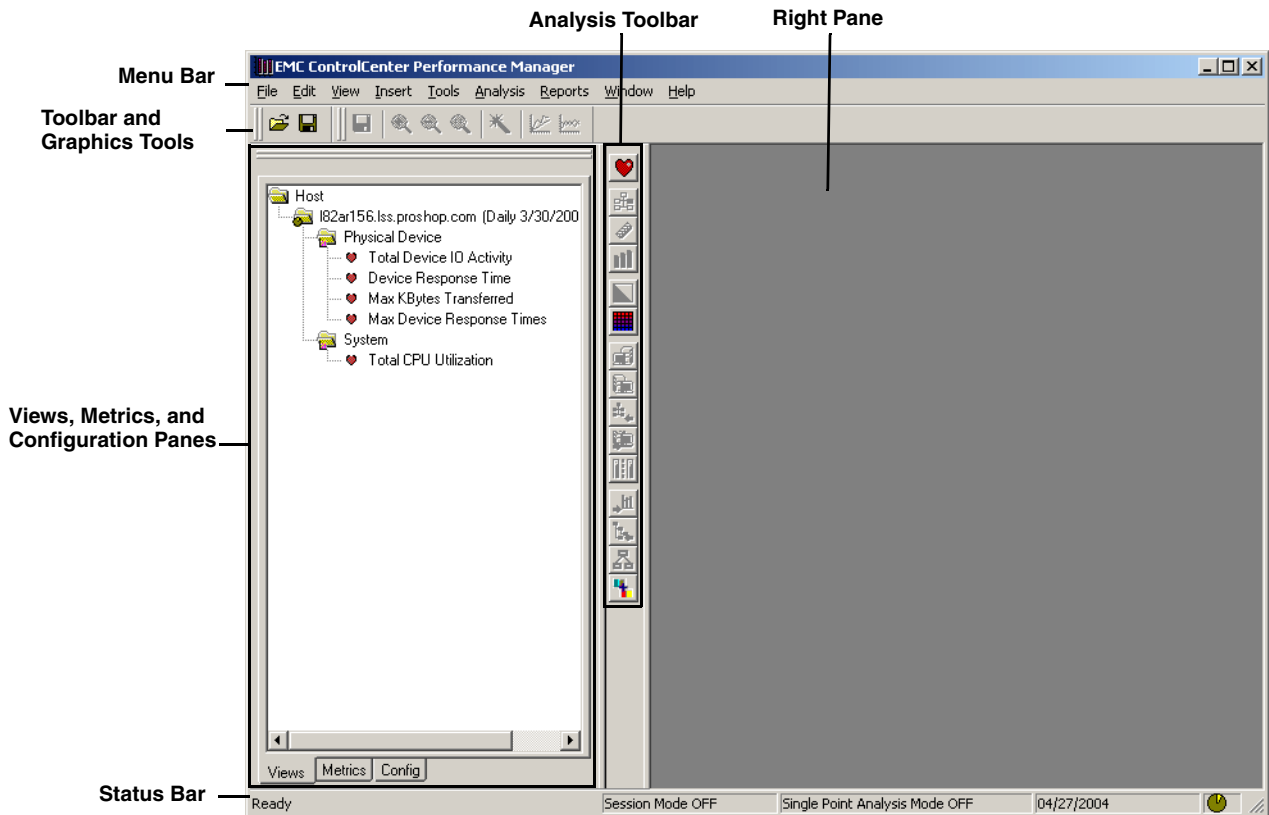


Figure 37 Performance Manager console

In the **Performance Manager** Console, the **Views, Metrics, and Configuration** (Config) panes provide high-level views of the performance data and options for configuring the reports. The Analysis toolbar provides buttons for selecting the type of report (graph, chart, and so on) to display in the right panel.

10. Clicks the **Metrics** tab.

The **Metrics** panes appear [Figure 38 on page 62](#).

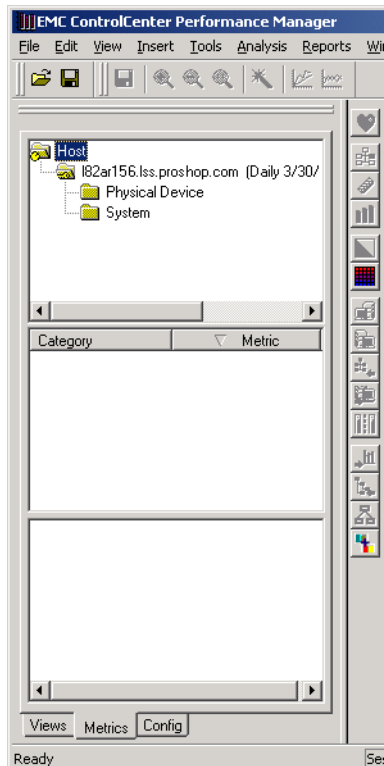


Figure 38 Metrics panes

The Metrics panes contain lists of objects or options for creating various data views (graphs, reports, and so on) of the performance data. Host l82ar156 appears in the top Metrics pane.

11. In the top Metrics pane, under the folder for host l82ar156, selects the **Physical Device** folder.

The devices on the host and the devices on the Symmetrix array to which the host is connected appear in the middle pane.

12. Clicks inside the middle pane to select a device.
13. Presses and holds the **Shift** key and then selects all devices in the middle pane.
14. In the bottom metrics pane, selects **response time (ms)** to view the device's response times (in milliseconds).

15. On the Analysis toolbar, clicks the **Graph Per Metric** (📊) button to create a graph of the metrics selected in the Metrics panes.

A graph appears in the right pane showing the response times of all devices on the host and the Symmetrix array [Figure 39 on page 63](#).

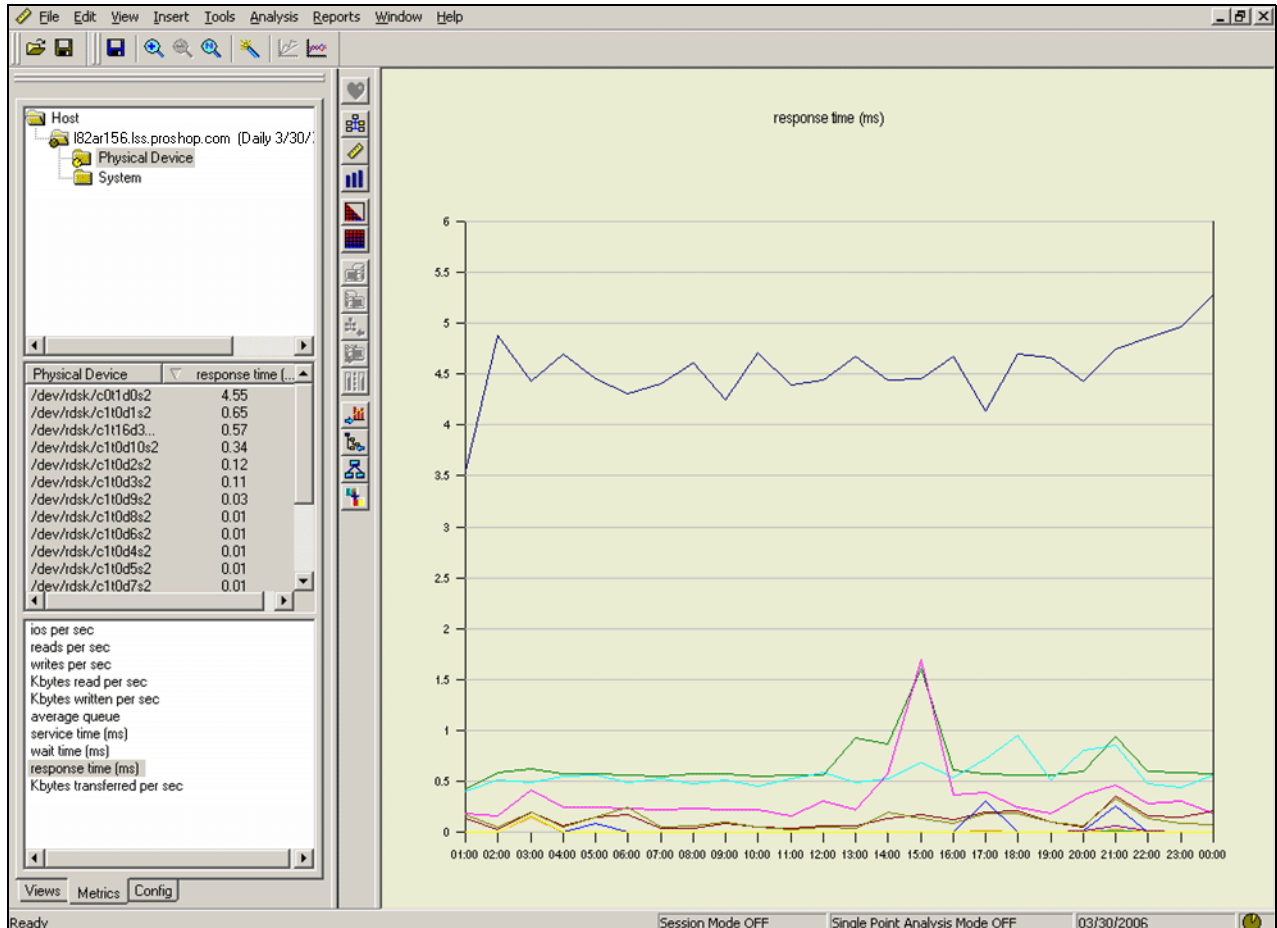


Figure 39 Metrics graph of host and array devices

Most of the response times of each of the devices are normal (less than 5 milliseconds), indicating that the performance problem is on host l82ar156 and not the Symmetrix array to which the host is connected. The DBA meets with the CTO and UNIX administrator to discuss how to further investigate the problems on the host that are related to performance.

Identifying a storage array performance problem

Continuing from the previous example, “[Identifying a host performance problem](#)” on [page 59](#), this example demonstrates how the UNIX administrator now analyzes the data collected on 3/31/06 to determine what caused the performance problems the sales department experienced at two peak periods (9 A.M. and 6 P.M.)

Accessing the host

The UNIX administrator opens the Repository holding the performance data collected for host l82ar156 and Symmetrix 000187400075.

To complete this task, the UNIX administrator:

1. On the menu bar, from the **File** menu, selects **Open**.
The **Data Selection** dialog box appears.
2. Under **Data Provider**, from the **Class** pull-down menu, selects **Host**.
3. From the **Identifier** pull-down menu, selects host **l82ar156**.
4. Under **Archives**, selects the radio button next to **Daily**.
5. Under **Daily**, selects **3/31/06**.
6. Clicks **OK**.

The Performance Manager console appears with host l82ar156 in the Views pane.

Analyzing the host device

The UNIX administrator now analyzes host device c2t0d2s2 (the device host l82ar156 uses to connect to the Symmetrix) for the performance problems. The DBA provides the name of the host device.

To complete this task, the UNIX administrator:

1. Clicks the **Metrics** tab to switch to the Metrics panes.
2. In the top Metrics pane, under the folder for host l82ar156, selects the **Physical Device** folder.
3. The devices for the host and the Symmetrix appear in the middle Metrics pane.
4. In the middle **Metrics** pane, selects device **c2t0d2s2**.

5. In the bottom pane, selects **response time (ms)**.
6. Clicks the **Graph Per Object** (📊) button.

A graph appears in the right pane showing response time for the device [Figure 40 on page 65](#).



Figure 40 Graph showing response time of device c2t0d2s2

The graph reveals that the device performance degraded at two peak periods (9 A.M. and 6 P.M.) that match the periods when the sales department claimed they noticed the performance problem.

Identifying the storage array disks

The UNIX administrator now wants to identify the disks on the Symmetrix array to which host l82ar156 is connected through device c2t0d2s2.

To complete this task, the UNIX administrator:

1. In the middle **Metrics** pane, selects all of the devices.
2. In the bottom **Metrics** pane, selects **ios per sec** to view the I/O statistics (per second) of the devices.
3. Clicks the **Histogram** (📊) button.

A histogram graph appears in the right pane [Figure 41 on page 66](#).

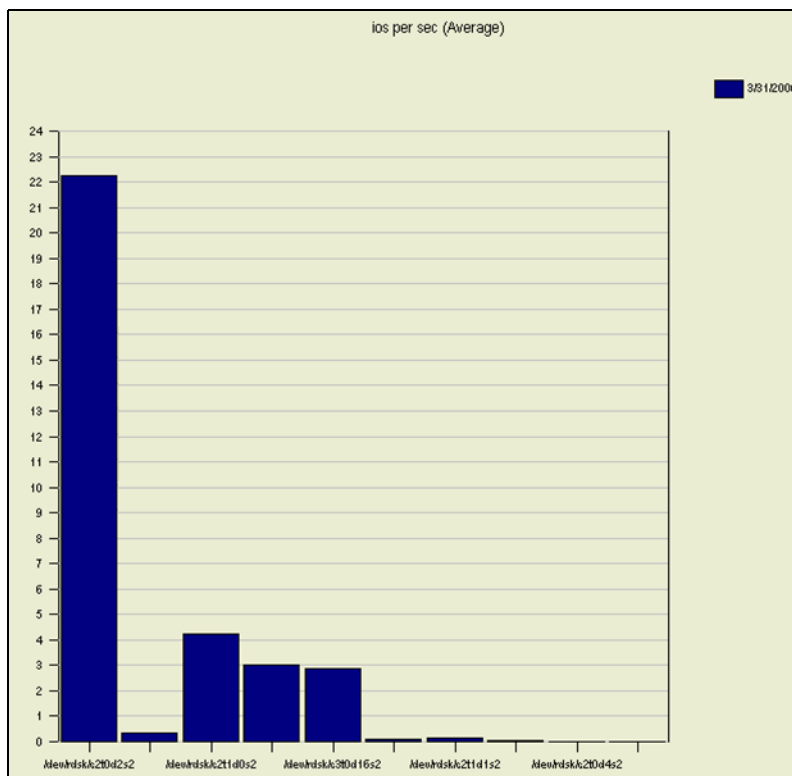


Figure 41 Histogram of all devices

A histogram graph is a bar graph of historical performance data. The X-axis shows the selected objects and the Y-axis displays the values of the selected metrics.

The histogram graph displays the *input/output per second data* for the selected devices. c2t0d2s2 appears as the first device.

4. Selects the **Config** tab at the bottom of the left-hand panes [Figure 42 on page 67](#).

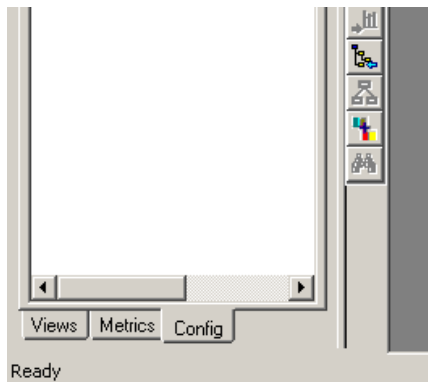


Figure 42 Tab for Configuration view

5. On the menu bar, on the **File** menu, selects **Open** and the **Data Selection** dialog box appears.
6. Under **Data Provider**, from the **Class** pull-down menu, selects **Host**.
7. From the **Identifier** pull-down menu, selects host **l82ar156**.
8. Under **Archives**, selects the radio button next to **Daily**.
9. Under **Daily**, selects **3/31/06**.
10. Clicks **OK** and the **Performance Manager** console appears with host l82ar156 in the **Views** pane.
11. On the menu bar, from the **File** menu, selects **Open** and the **Data Selection** dialog box appears.
12. Under **Data Provider**, from the **Class** pull-down menu, selects **Symmetrix**.
13. From the **Identifier** pull-down menu, selects **Symmetrix array 000187400075**.
14. Under **Archives**, selects the radio button next to **Daily**.
15. Under **Daily**, selects **3/31/06**.
16. Clicks **OK** and the Symmetrix array appears in the **Views** pane.
17. Right-clicks the Symmetrix and selects **Load Configuraton from Repository**
[Figure 43 on page 68](#).

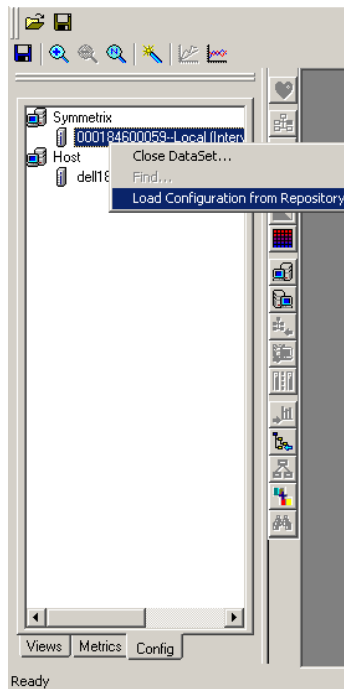


Figure 43 Loading configuration data

Config – As of 03/31/2006 appears in the left pane tree under the Symmetrix array.

18. Clicks **Config – As of 03/31/2006** in the tree.

A table appears in the right pane [Figure 44 on page 69](#).

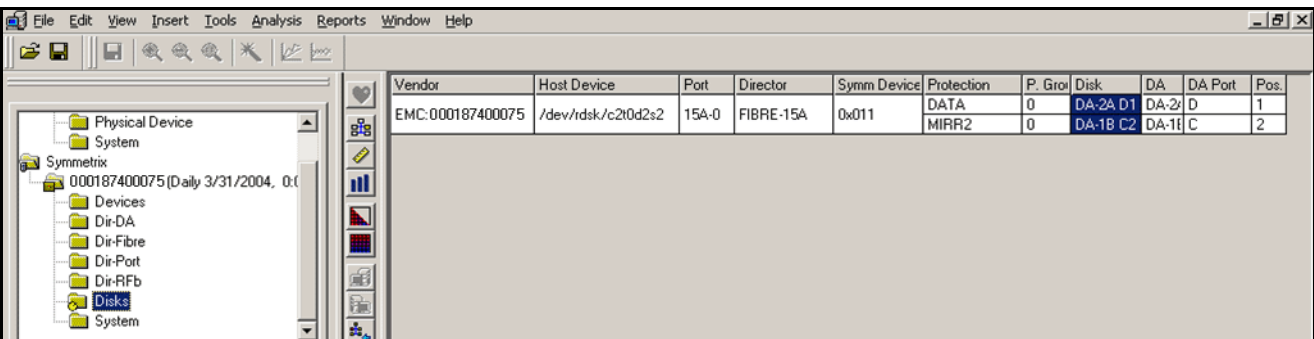


Figure 44 Symmetrix folder and a table of the Symmetrix configuration

The table displays the configuration between the host and the Symmetrix array, including the array device (0x011) to which device c2t0d2s2 is connected.

Analyzing storage array disks

Having identified the disks and the array device (0x011) on the Symmetrix array that host l82ar156 was using, the UNIX administrator now analyzes the disks to ensure that the host accessed them at 9 A.M. and 6 P.M. on this day.

To complete this task, the UNIX administrator:

- 1. In the middle **Metrics** pane, selects both disks.
- 2. In the bottom **Metrics** pane, selects **read commands per sec** to view the number of read commands 0x011 made (per second) to the disks.
- 3. Clicks the **Graph Per Metric** (📊) button.

A graph of the two disks appears showing that host l82ar156 did in fact access these disks at 9 A.M. and 6 P.M. [Figure 45 on page 70.](#)

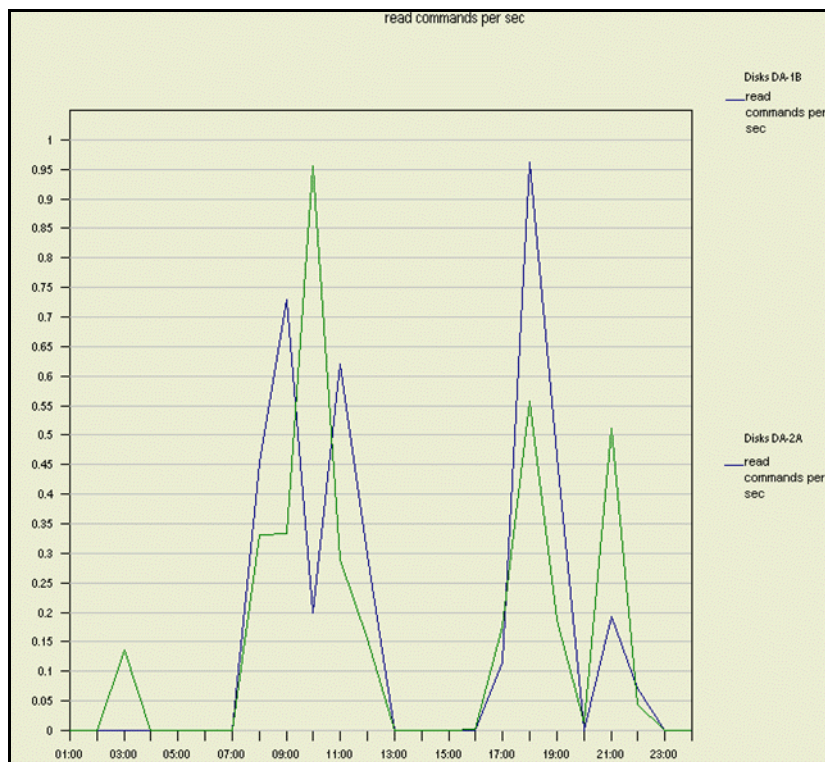


Figure 45 Graph of Symmetrix disks

Analyzing a storage array device

The UNIX administrator now analyzes array device 0x011 for the performance problems.

To complete this task, the UNIX administrator:

1. In the middle **Metrics** pane, selects device 0x011.
2. In the bottom **Metrics** pane, selects **%hit** to view the percentage of hits from the array device to the array cache (cache hit ratio).
3. Clicks the **Graph Per Metric** (📊) button.

A graph appears showing that the cache hit ratio fell considerably at 9 A.M. and 6 P.M. [Figure 46](#).

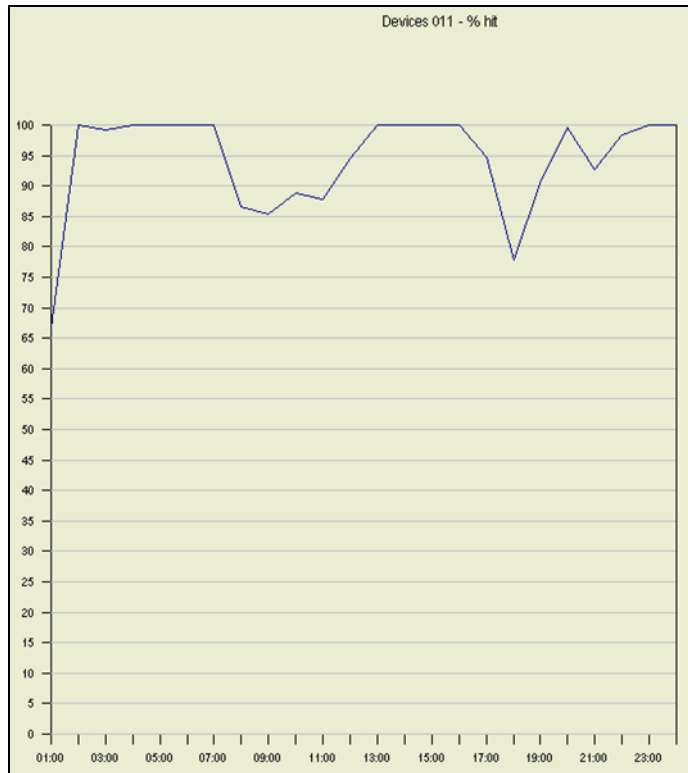



Figure 46 Graph of cache hit ratio on the Symmetrix array disk

4. In the bottom **Metrics** pane, select **read hits per second** and **read misses per second** to view the number of times device 0x011 found the data in the array cache (read hits) and the number of times the data had to be retrieved from the disk (read misses).

Clicks the **Graph per object** () button. A new graph appears showing that there were read misses at 9 A.M. and 6 P.M., which caused the cache hit ratio to fall [Figure 47 on page 72](#).

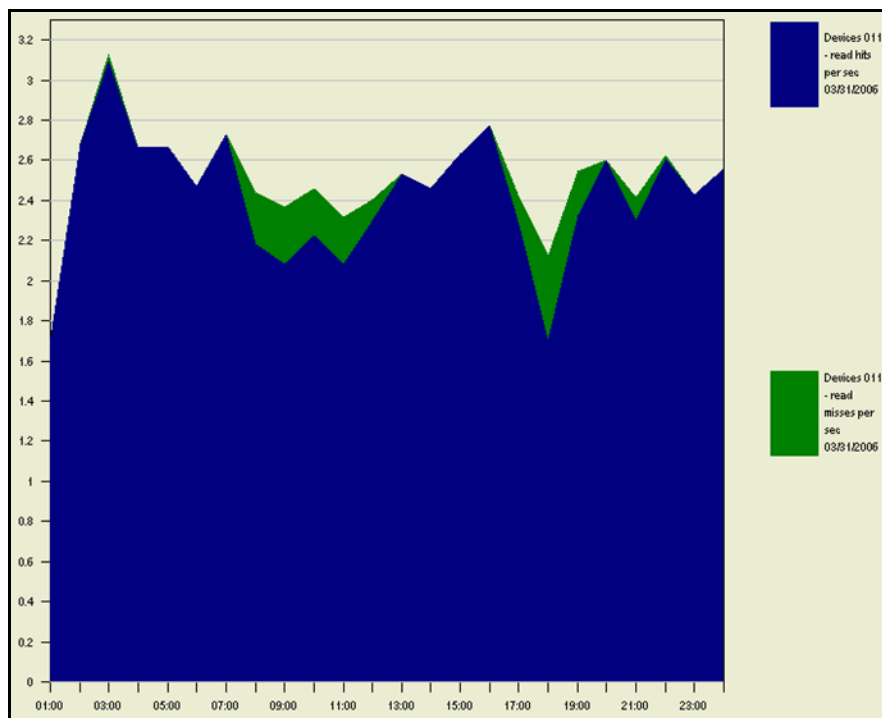


Figure 47 Graph showing read misses between Symmetrix disks and cache

Analyzing a storage array system

To confirm the read misses, the UNIX administrator now analyzes the entire Symmetrix array for the occurrence of destaged tracks (data moved from the cache back to the disks).

To complete this task, the UNIX administrator:

1. In the top **Metrics** pane, under the **Symmetrix** folder, selects the **System** folder.
The Symmetrix array (000187400075) appears in the middle metrics pane.
2. In the middle **Metrics** pane, selects the Symmetrix array.
3. In the bottom **Metrics** pane, selects **destaged tracks per sec** to view the number of data tracks that the array destaged.

A new graph appears showing that the Symmetrix destaged tracks of data during 9 A.M. and 6 P.M. [Figure 48 on page 73](#).

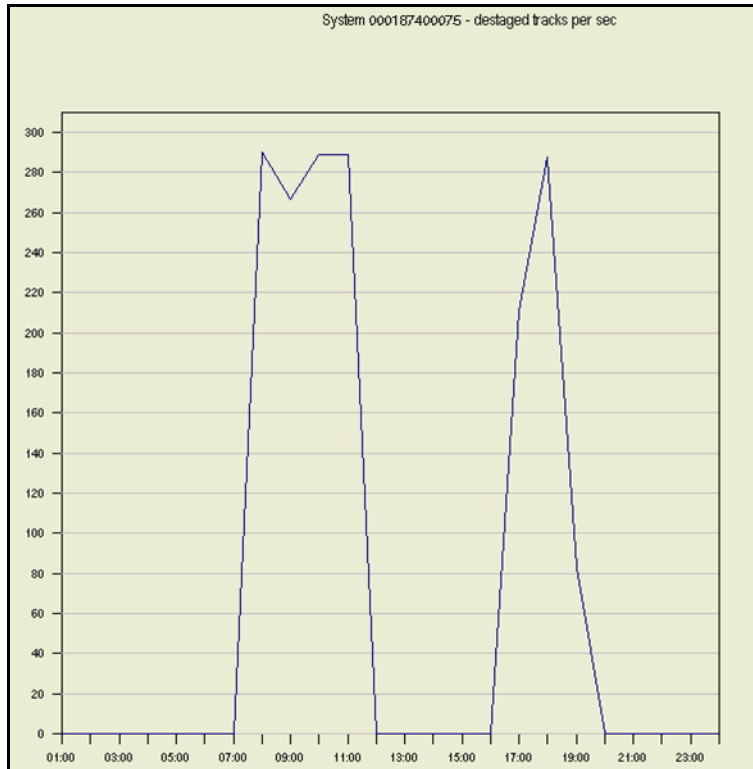


Figure 48 Graph of destaged data on the Symmetrix array

The UNIX administrator is now certain that the data destaging on the Symmetrix array is what caused the performance to degrade.

Identifying hosts connected to a storage array

Now the UNIX administrator needs to determine what caused the Symmetrix array to destage data, and checks to see if another host connected to the Symmetrix array was perhaps accessing the array at the same time as host l82ar156.

To complete this task, the UNIX administrator:

1. In the top **Metrics** pane, under the **Symmetrix** folder, selects the **Devices** folder.
All devices on the Symmetrix array that were active appear in the middle **Metrics** pane.

2. In the bottom **Metrics** pane, selects **total ios per sec** to view the total number of I/O's for each device.
3. In the middle **Metrics** pane, sorts **total ios per sec** in descending order and selects the top nine devices.
4. Clicks the **Links** (🔗) button.

The **Links** view appears in the right pane showing the end-to-end path of the Symmetrix array and the hosts connected to its devices [Figure 49 on page 74](#).

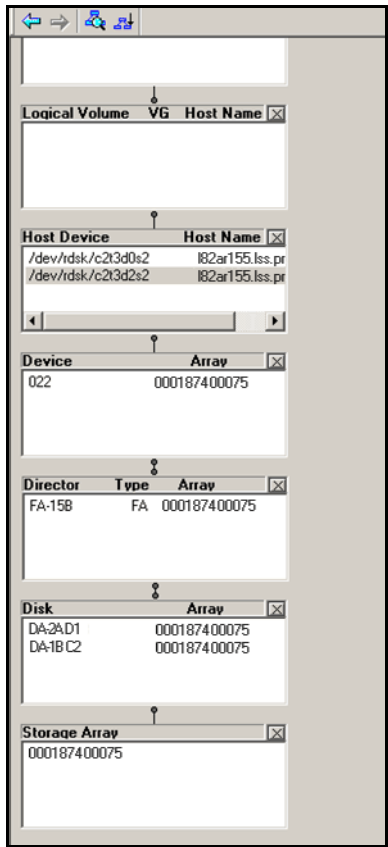


Figure 49 Links view showing the path between Host l82ar155 and the Symmetrix array

The **Links** view reveals that there are two devices on the Symmetrix array that are linked to two devices on another host (l82ar155).

5. In the **Links** view, under **Host Device**, selects one of the devices for host **l82ar155**.

6. In the top **Metrics** panel, under host **l82ar155**, selects the **Physical Device** folder.

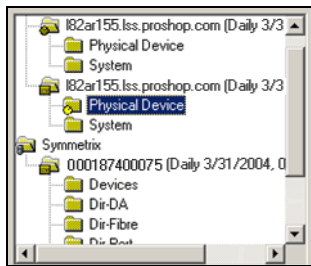


Figure 50 Host l82ar155 In the top Metrics pane

All of the host's and the Symmetrix array's disks appear in the middle Metrics pane.

7. In the middle **Metrics** pane, selects both disks.
8. In the bottom **Metrics** pane, selects **ios per sec.**
9. Clicks the **Graph Per Metric** (📊) button.

A graph appears in the right pane displaying the times when host l82ar155 accessed the Symmetrix array [Figure 51 on page 76](#).

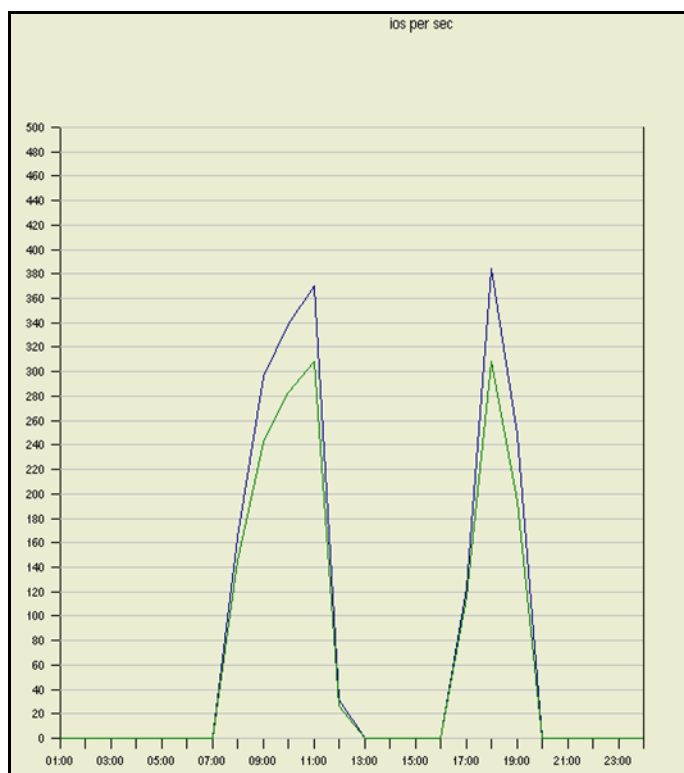


Figure 51 Graph showing times when host l82ar155 accessed the Symmetrix array

The two peak times when host l82ar155 accessed the Symmetrix array are identical to the times when host l82ar156 accessed the Symmetrix array (9 A.M. and 6 P.M.). Because host l82ar155 was accessing the devices that share the same disk spindle on the Symmetrix array as host 182ar156, the competing workload caused the performance degradation.

CHAPTER 3

Monitoring Your Datacenter

EMC Ionix ControlCenter provides solutions for monitoring your storage assets. Ionix ControlCenter alerts notify you of problems (for example, a port is down, a disk is down, a volume is low on storage capacity) in the datacenter, while views such as Properties, Topology, Relationship, and Path Details allow you to investigate alerts and determine corrective action for addressing them.

This chapter contains the following scenarios:

- ◆ Identifying and diagnosing loss of signal for a switch port 78
- ◆ Preventing a space shortage on a host logical volume 88
- ◆ Fixing a disk transfer rate alert..... 93
- ◆ Automating the resolution to an Oracle tablespace space shortage 96

Identifying and diagnosing loss of signal for a switch port

This example demonstrates how a storage administrator uses Ionix ControlCenter to respond to a Loss of Signal alert for a switch port. In this example, a company has already defined a process for problem notification and resolution that allows the administrator to quickly identify, diagnose, and resolve the issue.

The port for which the alert has triggered is critical to the company's business operations, so the administrator set the Loss of Signal alert for the switch port to Fatal during the Ionix ControlCenter implementation. They also set a monitoring schedule that ensured the administrator would receive notification within 15 minutes when a problem occurred.

Receiving the switch port alert

While exploring the properties of some file systems in the Ionix ControlCenter Console, the storage administrator notices a new switch port alert in the Alerts view (Figure 52 on page 78).

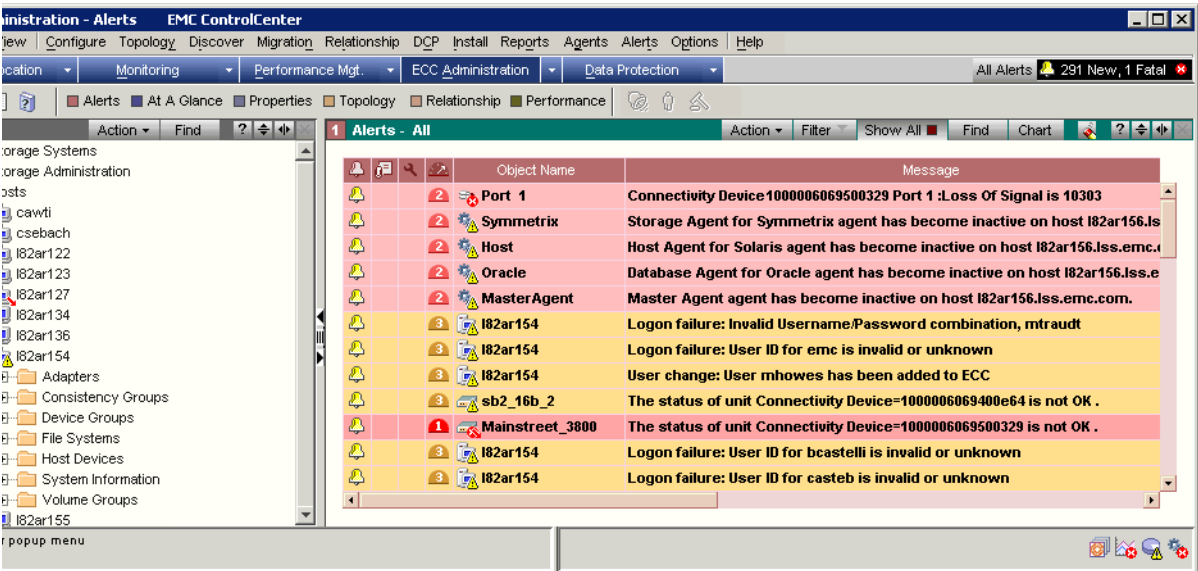


Figure 52 Switch port loss of signal alert

The alert indicates that the switch port is experiencing 10,303 signal losses within a 15-minute interval. (To determine the interval, the administrator right-clicks the alert and selects **Alert > Details** on the **Actions** tab or the **Alert Definition** dialog box, the schedule is every 15 minutes). This level of performance will severely affect communications between any devices that use the port. The storage administrator must take action immediately.

Acknowledging the alert

Following the procedures that the storage administrator established during the planning stage of the Ionix ControlCenter implementation, the administrator first acknowledges the alert to indicate to the rest of the IT staff that someone is addressing the issue.

To acknowledge the alert, the administrator:

1. Right-clicks the alert in the Alerts view and selects **Acknowledge** (Figure 53).

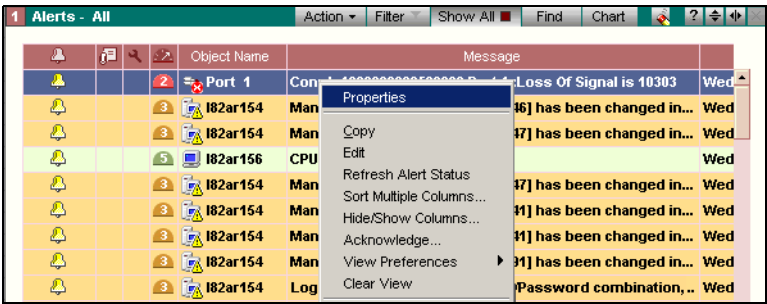


Figure 53 Acknowledging an alert

The **Acknowledge Alert** dialog box appears (Figure 54).

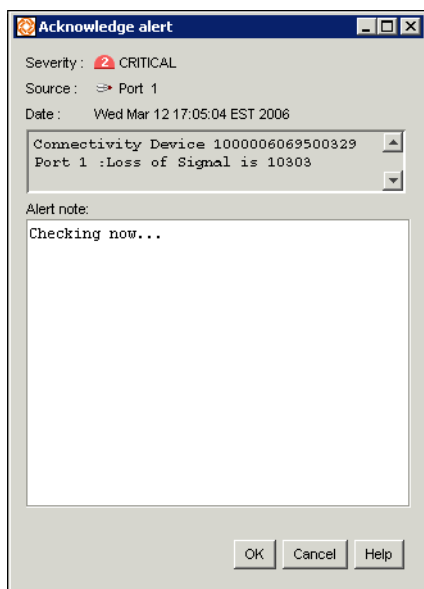


Figure 54 Acknowledge alert dialog box

2. Enters a note and clicks **OK**.

In the Alerts view, the alert text changes from bold to plain text and the administrator's ID appears in the Acknowledged By column.

Diagnosing the alert

To diagnose the switch problem, the administrator uses several views:

- ◆ Topology — To identify the other components to which the switch physically connects
- ◆ Path Details — To identify the paths that exist (mapping, I/O path) between the host device and the array logical volume across the SAN
- ◆ Properties — To find out more information about the host to which the switch connects
- ◆ Tree panel — To discover which business groups are affected by the issue

To use the Topology view, the administrator:

1. Clicks the horizontal split-screen icon in the Alerts view.

A new view appears below the Alerts view.

2. Clicks **Topology** on the toolbar to change the view type.
3. Drags the port from the Alerts view to the Topology view.
4. Clicks the plus sign next to the switch (Mainstreet_3800) in the middle of the view to show its ports.

The Topology view shows the switch on which the port resides. In the view, a red X icon indicates the port with the problem (Figure 55).

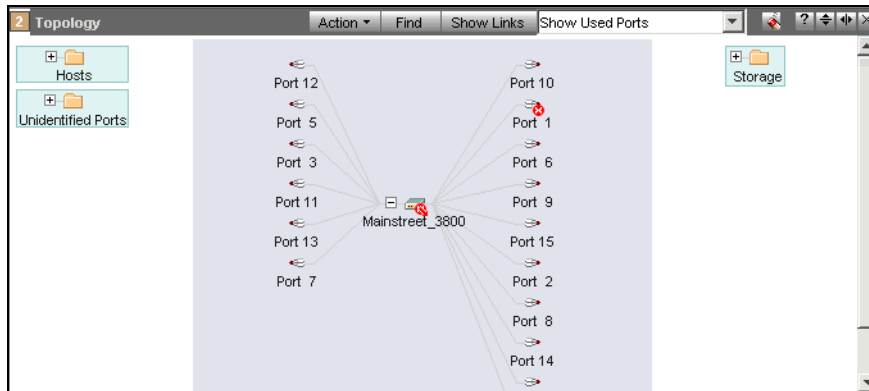


Figure 55 Topology view

5. Clicks **Show Links** on the Topology view toolbar to draw the links between the switch ports, hosts, and storage.
6. Expands the **Hosts** folder on the left and the **Storage** folder on the right.
7. Resizes the Topology view to see the connections more clearly and places the cursor over the link between the troubled switch and the director port to highlight it (Figure 56).

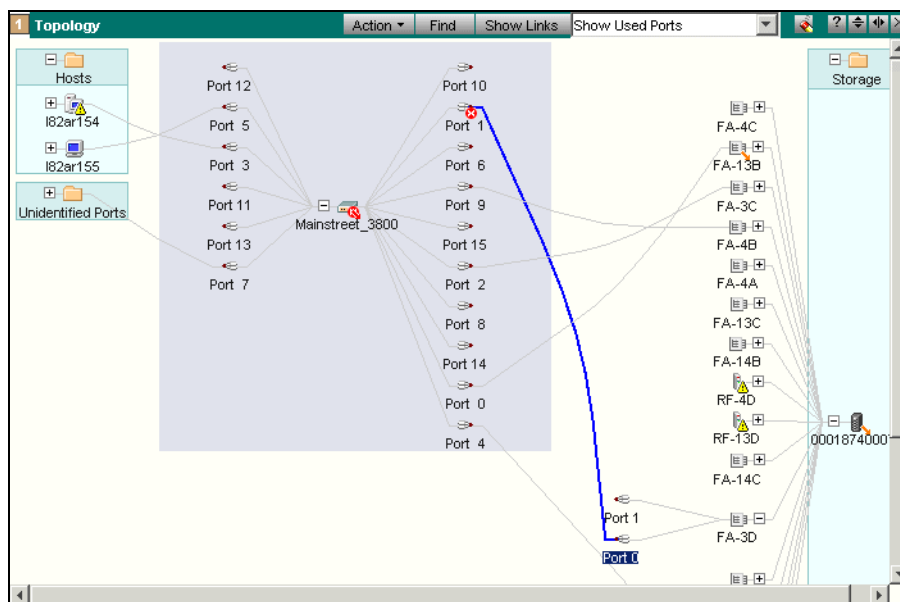


Figure 56 Expanded Topology view

The Topology view shows that the switch port possibly connects either of two managed hosts to the FA-3D director on the 00075 Symmetrix array.

Using the Path Details view

To find out if either host is affected, the administrator uses the Path Details view, which shows detailed information about the I/O path between host devices and storage array logical volumes.

To use the Path Details view, the administrator:

1. Clears the Alerts view to create space for the Path Details view.
2. Clicks the down arrow next to **Storage Allocation** on the task bar and selects **Path Details** (Figure 57).

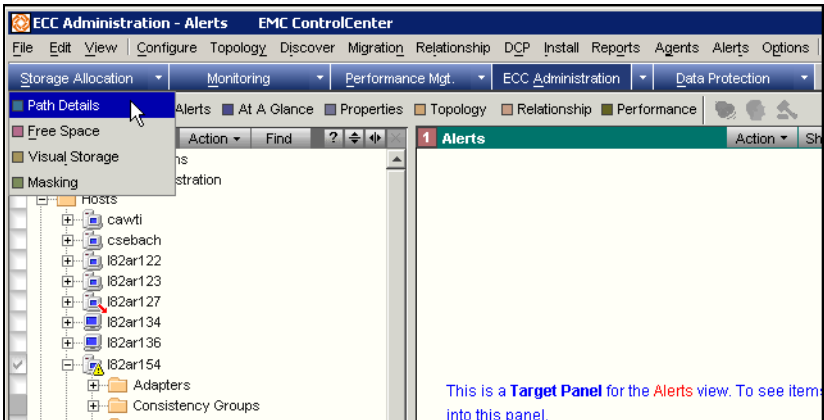


Figure 57 Opening a Path Details view

The empty view above Topology changes to Path Details.

3. Drags the array's front-end director from the Topology view to the Path Details view.
4. Under **Select Object**, selects the front-end director and clicks **Show Devices**.

The Path Details view now shows which host devices the affected director is mapped to. By highlighting the affected connection in the table in the top part of the view, the administrator sees more details about this I/O path in the lower part of the view (Figure 58).

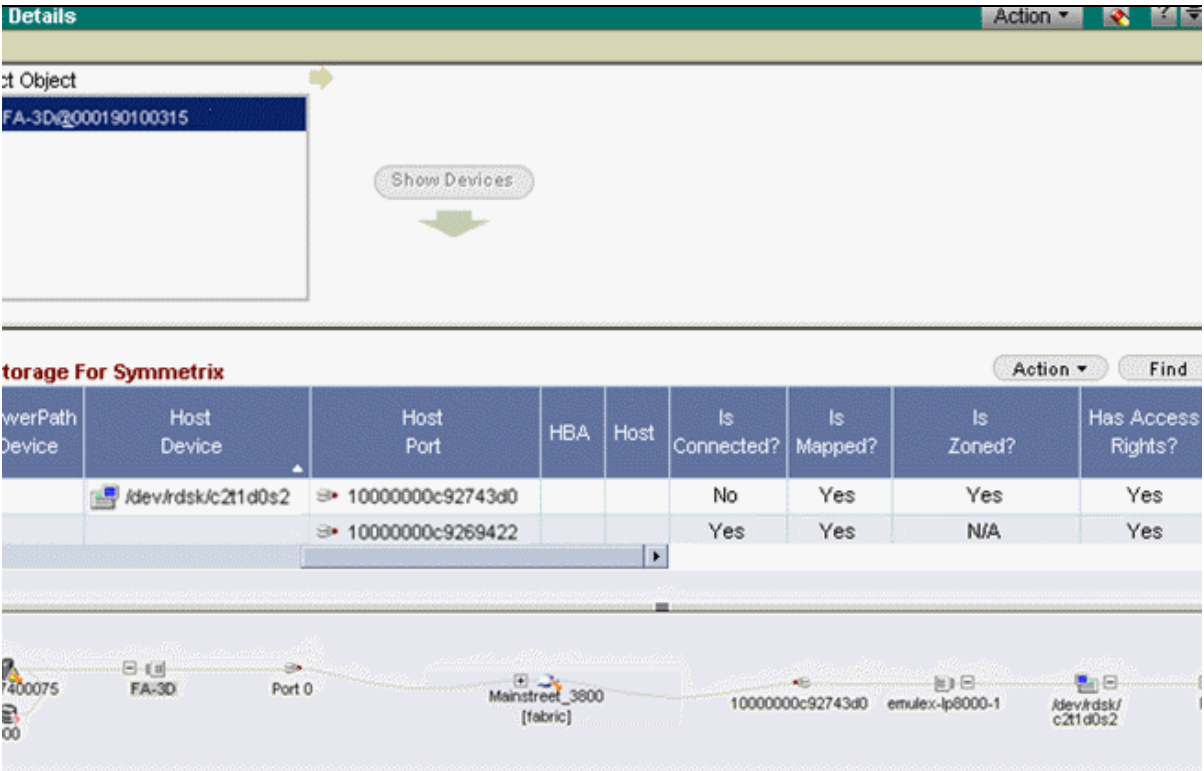


Figure 58 Path Details view

Using the Path Details view, the administrator identifies which file system is connected to the down switch port.

Identifying affected applications or business units

To see which applications or business units are affected by the poor switch performance, the administrator:

1. Right-clicks the host in the Path Details view and selects **Properties**.
2. Selects the host in the Properties view.

In the tree, an icon appears next to each folder to which the host belongs. By looking at the folders in the tree, the administrator sees that the host belongs to the Sales department and is a part of their Sandbox application (Figure 59), which is a test environment for a new e-commerce application.

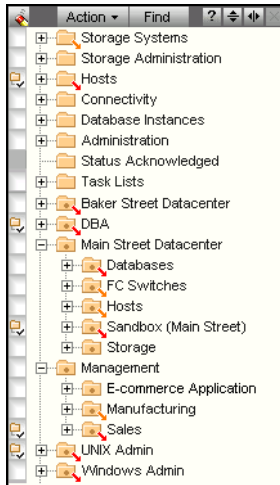


Figure 59 Identifying the groups to which a host belongs

The administrator contacts the application developers working on the Sandbox application and collaborates with them to identify the problem.

Closing the issue

After verifying that the switch performance has improved and that no other systems were adversely affected by the fix, the administrator closes the issue using the department's new procedures.

To close the issue, the administrator:

1. Reopens the **Alerts** view by right-clicking the port in the **Topology** view and selects **Alerts** (Figure 60).

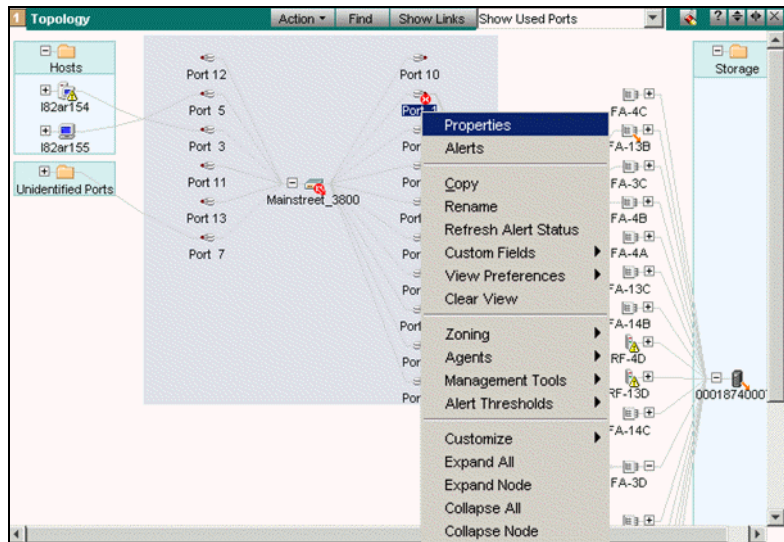


Figure 60 Reopening the Alerts view

An Alerts view showing only the port alert appears below the Topology view.

2. Right-clicks the alert in the Alerts view and selects **Alerts > Clear Alert for All Users** (Figure 61).

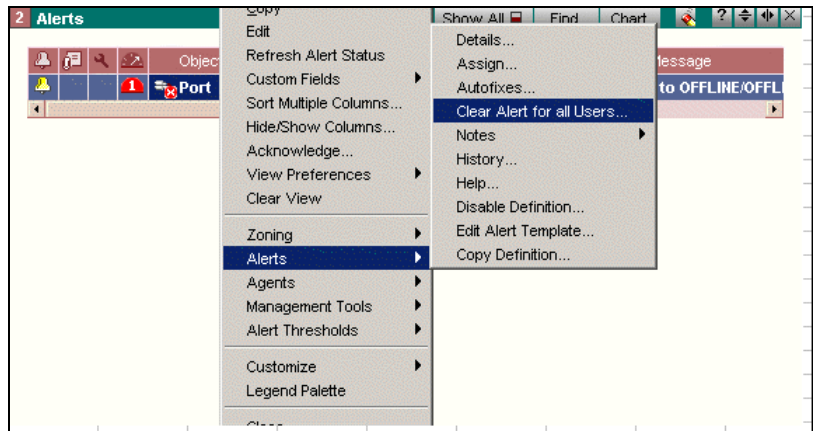


Figure 61 Clearing the switch port alert

The **Clear Alert** dialog box appears (Figure 62).

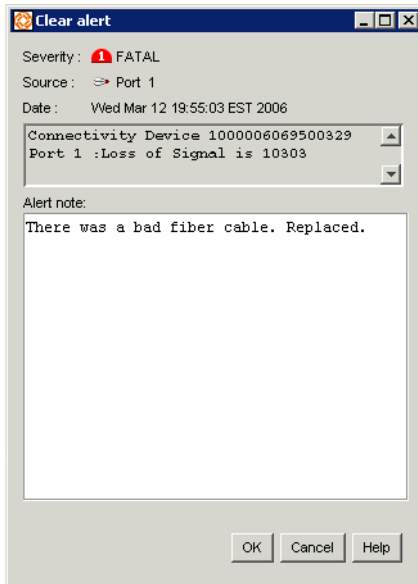


Figure 62 Adding an alert note

3. Types a note about how the issue was resolved and clicks **OK**.

The alert will appear in the Alert History view for one month, based on the Alert data retention policy the administrator set during configuration.

If a similar issue occurs, the monitoring schedule is set to notify the administrators within 15 minutes of the problem. Administrators can help diagnose and resolve the issue by searching the alert notes.

Preventing a space shortage on a host logical volume

In this example, the Windows administrator receives notification that a logical volume on a Windows host has reached a critical space threshold: 5 percent capacity remaining. The volume surpasses the threshold at 9 P.M., after the administrator has already left the office for the day.

Receiving an alert in BMC PATROL

During the alert configuration phase, the Windows administrator created an alert for a set of key application volumes, which included this volume. The administrator configured a management policy that would propagate the alert to BMC PATROL if the alert persisted for a certain time period (exactly for situations in which the administrator was away from the office).

The late-shift operator whose responsibility it is to monitor BMC PATROL notices the alert (Figure 63).

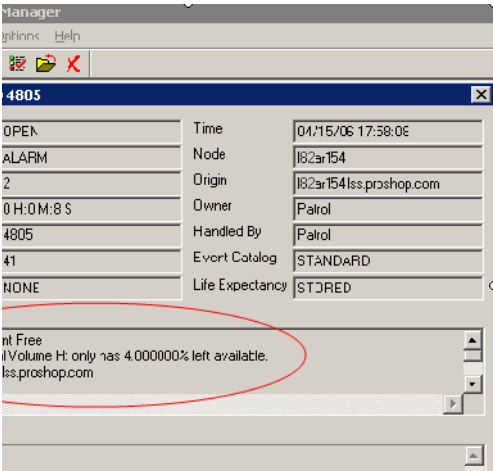


Figure 63 A Ionix ControlCenter alert in BMC PATROL

The operator pages the Windows administrator.

Diagnosing a free space alert

The Windows administrator logs in to the Console from home using terminal services to access Ionix ControlCenter across the company’s firewall.

Following the company's procedures, the administrator first acknowledges the alert in the **Alerts** view to indicate that someone is addressing the issue. In the Alerts view, the administrator right-clicks the alert, selects **Acknowledge Alert**, enters a brief note in the dialog box, and clicks **OK** to close it.

To diagnose the free space alert, the administrator:

1. Clicks the horizontal split-screen icon in the Alerts view to create a new view.
2. Clicks **Relationship** on the Console toolbar to change the view type of the new view.
3. Drags the host from the Alerts view to the Relationship view.

The Relationship view shows how the host logical volumes map back to the array devices (Figure 64).

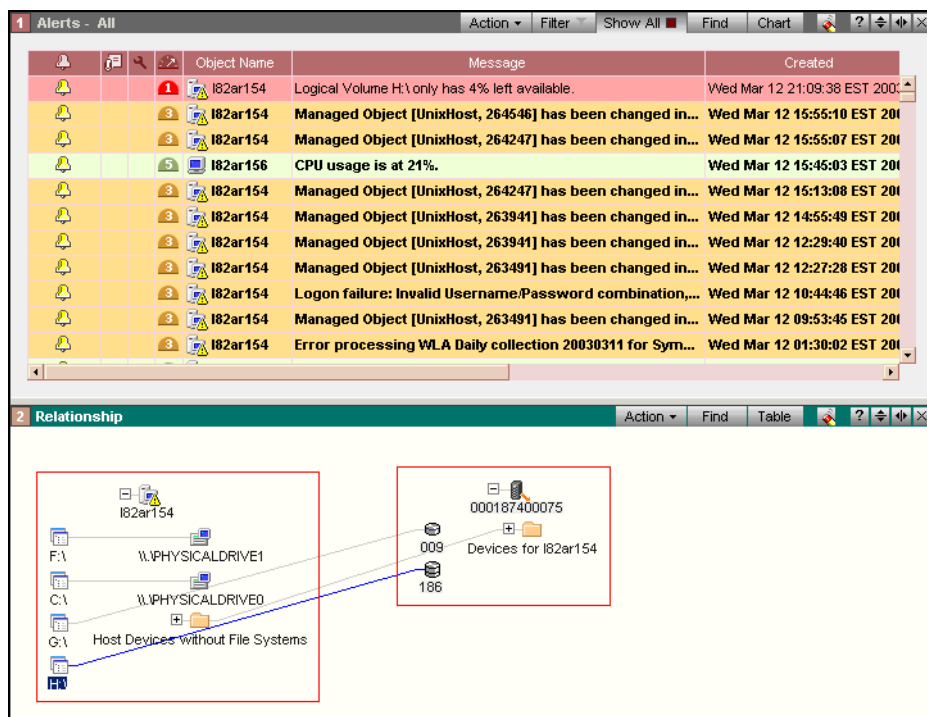


Figure 64 Relationship view

4. Right-clicks the volume in the Relationship view and selects **Properties** to find out the actual free space available on the volume.

A new Properties view opens below the Relationship view. The new view shows the volume size and the amount of free space available the last time the host's Discovery data collection policy ran (Figure 65).

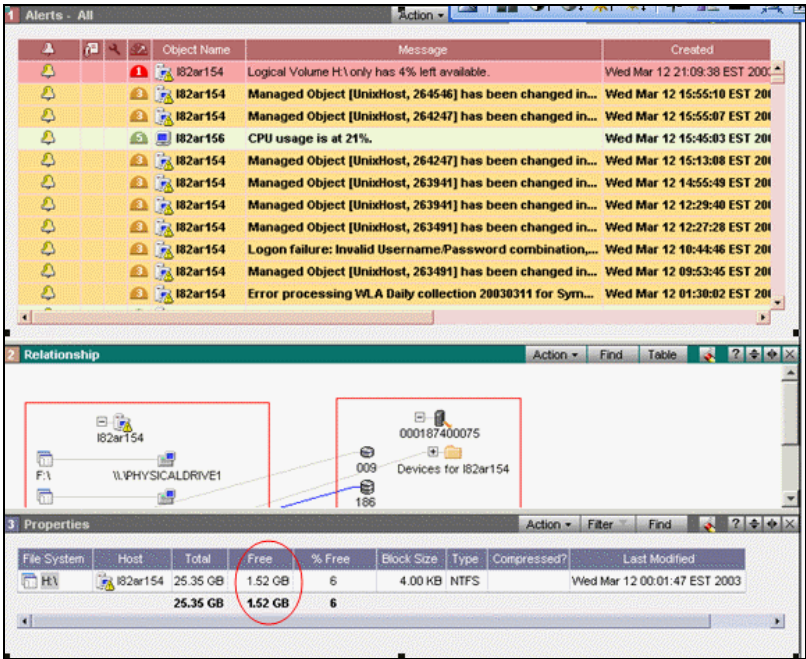


Figure 65 Host file system Properties view

According to the Last Modified column in the Properties view, the Discovery policy last ran just after midnight. At that time, the free space was about 6 percent, or 1.52 GB. The Properties view shows a different value than the alert is reporting because the Properties view is populated from the Repository, while the alert is updated according to the schedule that it is assigned. During the alert configuration stage, the Operations Manager and Windows administrator assigned this alert an hourly schedule.

The Windows administrator could update the Properties view by right-clicking the host and selecting Rediscover, which would cause Ionix ControlCenter to run the Discovery data collection policy for the host. Alternatively, the administrator could set the policy to run more frequently than once per day.

Locating additional free space

Because the logical volume free space has fallen below the fatal threshold, the Windows administrator decides to act immediately and find additional free space.

To find additional free space for the logical volume, the administrator:

1. Closes the Properties view.
2. Drags the top of the Relationship view up to better see the view's contents.
3. Expands the **Devices for l82ar154** folder.

The administrator notices that there are several array devices that are already mapped to the host. These devices might be available for extending the logical volume. The icons in the Relationship view indicate the device types.

4. Highlights several standard devices by clicking, pressing and holding the **Ctrl** key, and clicking additional devices.
5. Right-clicks one of the highlighted devices and selects **Properties**.

A new Properties view opens. The highlighted devices are added to the view (Figure 66).

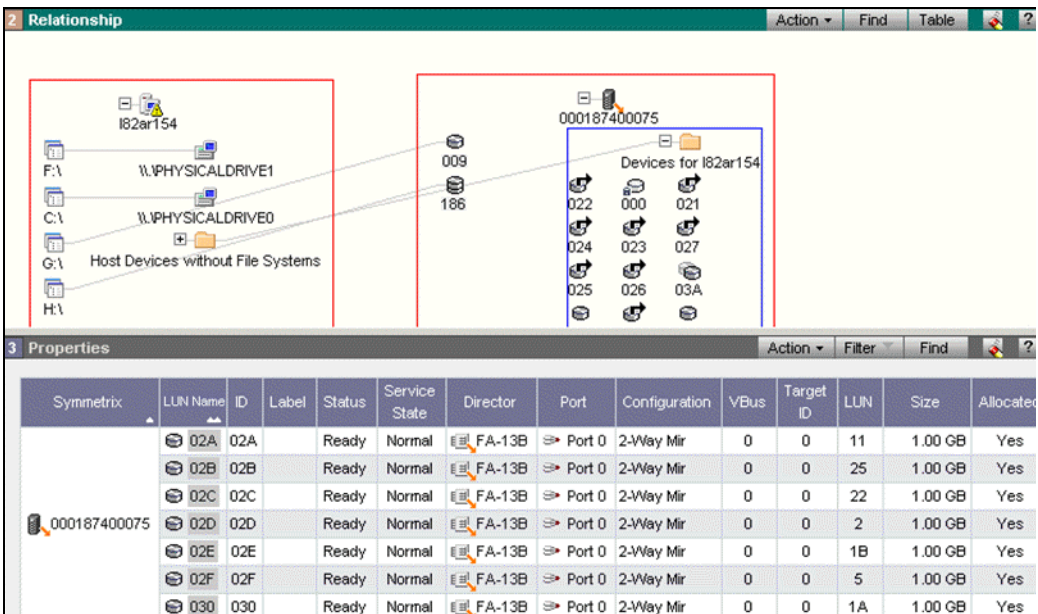


Figure 66 Symmetrix device Properties view

Extending the logical volume

The administrator identifies some volumes available to extend the logical volume and will use Ionix ControlCenter to do it right away.

To extend the logical volume, the administrator:

1. Right-clicks the logical volume and selects **Allocation, Extend Logical Volume**.
2. Completes a series of dialog boxes.

Closing the issue

After confirming that the logical volume has sufficient space, the administrator follows the new departmental procedures to close the issue and document the resolution.

The administrator clears the alert from the Alerts view and adds a note about the diagnosis and resolution.

Fixing a disk transfer rate alert

In this example, a senior Windows administrator receives notification about the performance of a disk on a vital Windows server. The alert is a Physical Disk Bottleneck (Transfer Rate) alert, which triggers when the transfer rate for a Windows disk exceeds a threshold. The senior administrator assigns the alert to a junior administrator to investigate.

Assigning the alert

To assign the alert, the senior administrator:

1. Right-clicks the alert in the Alerts view and selects **Alerts, Assign**.
The **Assign Alert** dialog box appears.
2. Selects the junior administrator's ID in the **Assign To** field.
3. Records a note about possible causes for the alert in the **Notes** field and suggests that the junior admin use the Relationship view to see how the disk is mapped.
4. Clicks **OK**.

The alert text changes from bold to plain text in the Alerts view, indicating that the alert has been acknowledged. The **Assigned To** column shows the junior administrator's ID. The **Acknowledged By** column shows the senior administrator's ID.

Diagnosing the alert

The junior administrator has sorted the Alerts view by the Assigned To column to see which alerts the administrator has been assigned. When the new alert appears, the administrator notices it.

To diagnose and resolve the issue, the administrator:

1. Notices the note icon in the first column of the Alerts view, right-clicks the alert, and selects **Alerts > Notes > Note**.
The **View/Add Notes** dialog box appears.
2. Reads the senior administrator's note about using the Relationship view and closes the dialog box.
3. Clicks the horizontal split-screen icon to create a new view below the Alerts view.

4. Clicks the **Relationship** button on the Console toolbar to change the new view type.
5. Drags the affected disk from the Alerts view to the Relationship view.

The Relationship view maps the host device back to the Symmetrix physical disk on which it resides (Figure 67).

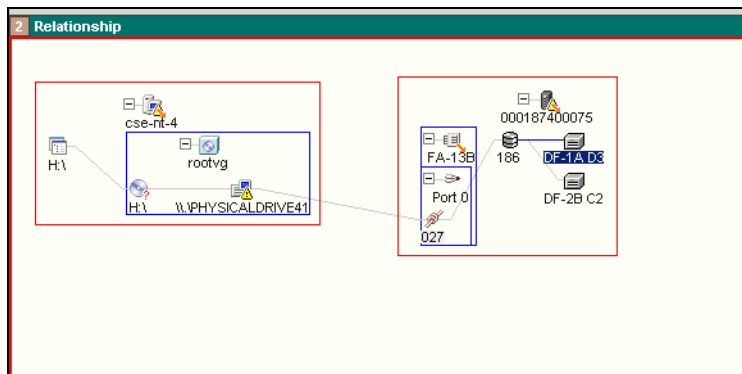


Figure 67 Mapping a host device in the Relationship view

6. Drags the disk outside of the red box in which it resides and drops it in a blank area of the Relationship view.

This causes the view to redraw itself with the Symmetrix disk, which is now the subject of the view. The view reveals that disks on two other hosts are mapped to LUNs that also use this disk (Figure 68).

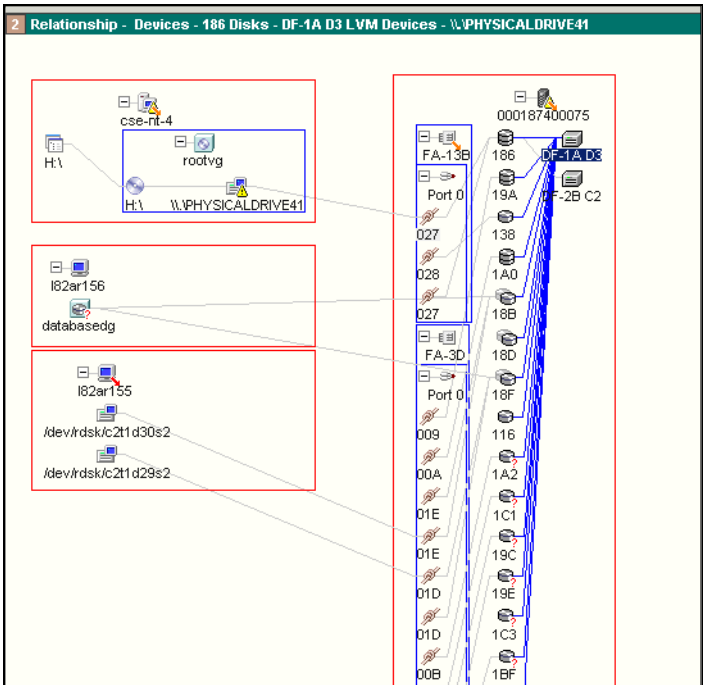


Figure 68 Viewing Symmetrix disk relationships

The junior administrator realizes that the host devices are likely contending for the physical disk cycles. So, the administrator reassigns the alert to the senior administrator and adds a note about the diagnosis. The senior administrator is likely to have to remap one of the host devices.

Automating the resolution to an Oracle tablespace space shortage

In this example, a tablespace that belongs to the Sales database exceeds a threshold of 95 percent occupancy. The database administrator (DBA) identifies the problem by noticing an alert icon on the DBA folder in the tree.

During the configuration phase, the DBA configured an autofix that would automatically trigger a script he had previously written to expand a tablespace. He attached the autofix to the tablespace alert.

Following the alert trail

The DBA first identifies the tablespace problem when a downward-pointing arrow appears on the DBA folder in the tree (Figure 69).

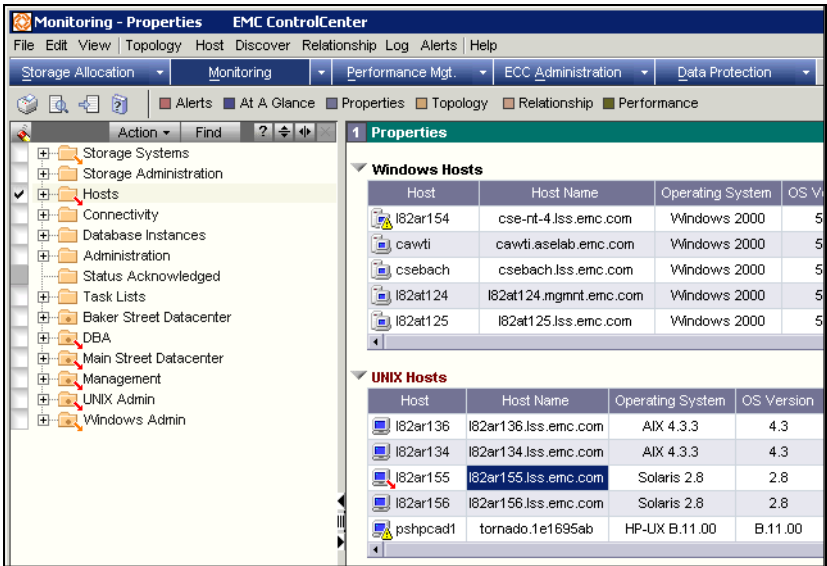


Figure 69 An alert in the DBA folder

During the configuration phase, the Operations Manager and DBA created the DBA folder in the tree to contain the hosts and databases for which the DBA is responsible.

To find out which host or database has the problem, the DBA:

1. Expands the **DBA** folder and places a checkmark next to the folder in the tree to view the Properties of all the objects in the folder.
2. Follows the trail of arrows in the tree to discover which object has the alert. The DBA expands **Databases**, the **sales** database, and then **Tablespaces**.

A red icon appears on the Sales object, indicating a critical or fatal alert (Figure 70).

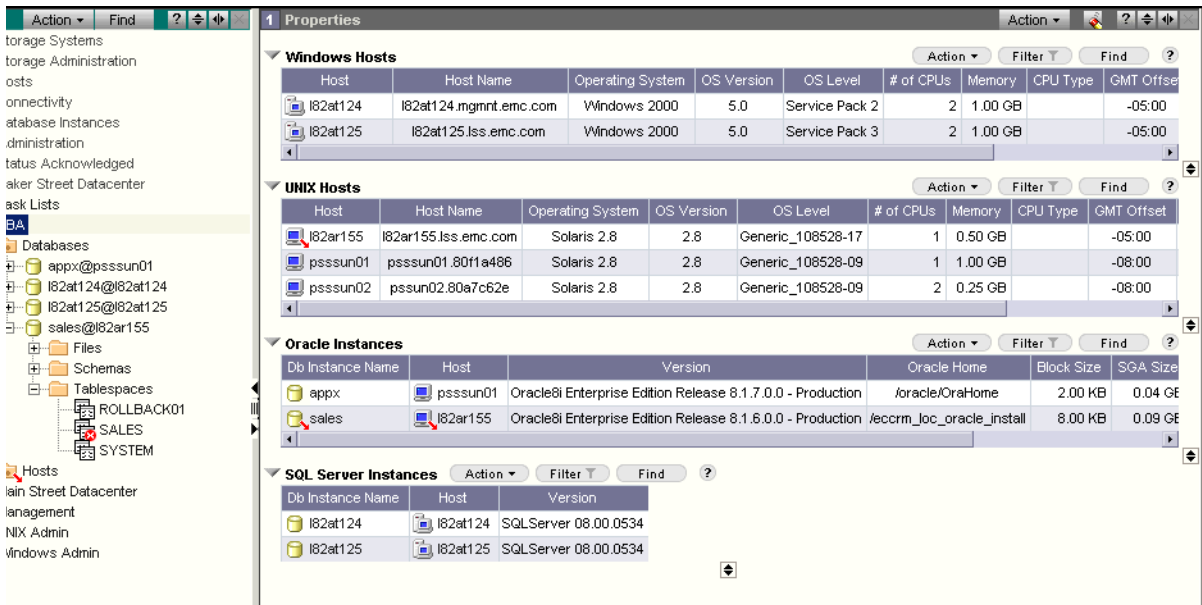


Figure 70 Locating the source of an alert

The downward-pointing arrow also appears on host l82ar154 because the database instance with the alert resides on that host.

Viewing the alert

To view the alert text, the DBA:

1. Clicks the horizontal split-screen icon in the Properties view to create a new view.
2. Clicks **Alerts** on the Console toolbar to change the new view type to an Alerts view.
3. Drags the Sales tablespace from the tree to the Alerts view.

The alert text appears in the view (Figure 71).

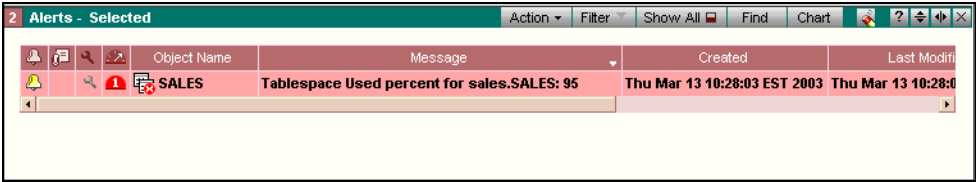


Figure 71 Viewing the alert text

A wrench icon appears in the Autofix column as a reminder that during configuration, an autofix was created to automatically expand a tablespace when it hits a critical threshold. The icon indicates that the autofix is currently running.

While the DBA is reviewing the alert, the wrench icon changes; a green checkmark appears on top of it indicating that the autofix completed with a return code of zero (Figure 72).

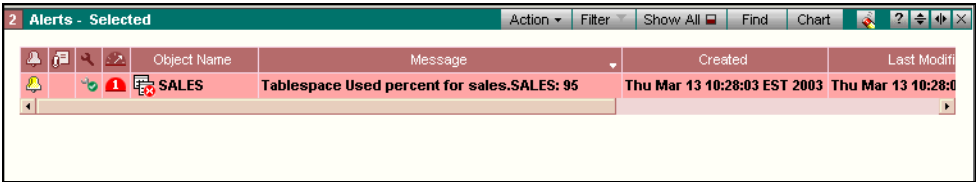


Figure 72 Icon indicating a successful autofix

Verifying the fix

To verify that the autofix script successfully expanded the tablespace, the DBA:

1. First acknowledges the alert to indicate that someone is working on the issue.
2. Clears the Properties view in the top half of the view panel.
3. Drags the tablespace from the Alerts view to the empty Properties view.

The Properties view shows that the tablespace is now 24 percent free (Figure 73).

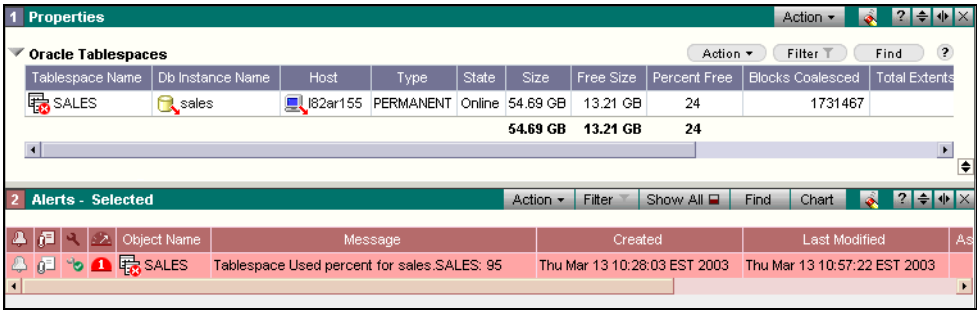


Figure 73 Viewing Tablespace Properties

Clearing the alert

After confirming that the tablespace has sufficient storage space, the administrator notes the resolution for the problem, and then clears the alert from the Alerts view.

CHAPTER 4

Configuring and Controlling Your Datacenter

EMC Ionix ControlCenter simplifies the tasks around configuring and controlling your storage assets by providing tools for planning a datacenter, and creating, configuring, allocating, and provisioning storage.

This chapter contains the following scenarios:

- ◆ [Validating and optimizing a SAN configuration](#) 101
- ◆ [Allocating storage to a host from a Symmetrix array.....](#) 119
- ◆ [Allocating CLARiiON devices \(LUNs\) to a host](#) 155
- ◆ [Adding devices to a CLARiiON metaLUN for a host](#) 163
- ◆ [Adding HP XP LUSEs to a host.....](#) 170
- ◆ [Deallocating storage from a host](#) 179
- ◆ [Allocating storage using AutoPath](#) 187

Validating and optimizing a SAN configuration

This example demonstrates how a storage administrator uses Ionix ControlCenter SAN Advisor™ to model and validate a SAN environment for interoperability, high availability, configuration rules, and best practices.

The administrator performs the following tasks:

- ◆ Validates the existing SAN environment
- ◆ Models proposed SAN changes for interoperability, availability, and performance
- ◆ Builds an action plan for implementing changes
- ◆ Implements the changes
- ◆ Verifies correct plan information

This configuration consists of a new HP XP 48 connected through a Brocade switch to a single Windows host. After building the existing environment in SAN Advisor, the administrator will add new hosts to the design to verify the interoperability of new configurations.

Logging in to SAN Advisor

The administrator logs in to SAN Advisor as follows:

1. On the **Start** menu, selects **Programs > EMC > SAN Advisor**. The **SAN Advisor** login page appears.
2. Enters the username and password and clicks **Login**. The **SAN Advisor** home page appears (Figure 74).

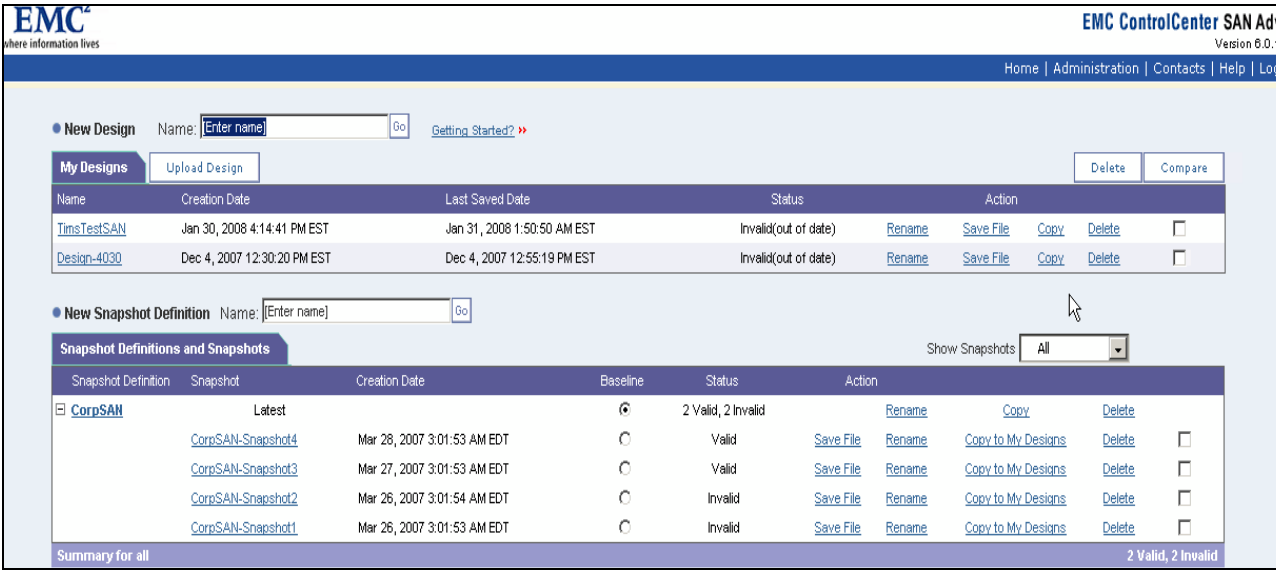


Figure 74 SAN Advisor home page

Validating an existing SAN environment

SAN Advisor takes snapshots of Ionix ControlCenter-managed environments. These snapshots help accelerate SAN design and change management by allowing you to model and validate environment changes before implementing them.

The administrator takes a snapshot of the existing SAN environment from the Ionix ControlCenter Repository and directly from servers running SNMP as follows. (For information on supported host and agent details, refer to the SAN Advisor online help.)

To validate the SAN, the administrator:

1. Enters the name of the new snapshot definition and clicks **Go**.

The **EMC Ionix ControlCenter Host** page appears (Figure 75 on page 103).

Snapshot Definition Name: Corp SAN

ControlCenter Host
Select Fabrics
Match To EMC Support Matrix
Take Snapshot
Schedule Snapshots
Report

ControlCenter Host Information

Complete the ControlCenter connectivity information below. Make sure you are running ControlCenter 5.2 or higher, the ControlCenter Web Console component is installed on the target host, and you have IP network connectivity on port 38988 from the SAN Advisor host to the ControlCenter host. The ControlCenter credentials you use must have a minimum of read access.

ControlCenter Host Name / IP Address: 171.23.142.25
ControlCenter User Name: lss\jdoe
ControlCenter Password:
Supported ControlCenter versions: 5.2 SP5 and 6.0

SNMP Information (Optional)

SAN Advisor can collect additional host information via SNMP. If you want SAN Advisor to attempt this, provide the following SNMP information.

☐ Use SNMP
Community String: public (separate with commas)
Port Number: 161

Submit
Next

Figure 75 SAN Advisor Ionix ControlCenter Host page

2. Enters the Ionix ControlCenter hostname or IP address, username, and password. To use SNMP for host data collection, selects the **Use SNMP** box, and enters the SNMP community strings and port number.

When finished, clicks **Next**.

The **Select Fabrics** page appears showing all Ionix ControlCenter-managed physical fabrics and systems (Figure 76).

Snapshot Definition Name: CorpSAN

ControlCenter Host **Select Fabrics** Match To EMC Support Matrix Take Snapshot Schedule Snapshots Report

Fabric Name	Select All <input type="checkbox"/>	Path Data <input type="checkbox"/>	# Hosts	# Switches	# Arrays	Total
ASE cab 2 sw	<input type="checkbox"/>	<input type="checkbox"/>	16	7	6	29
ASELAB DS16B 170	<input type="checkbox"/>	<input type="checkbox"/>	6	2	1	9
ASE 9509	<input type="checkbox"/>	<input type="checkbox"/>	0	1	0	1
DS-32M cab7	<input type="checkbox"/>	<input type="checkbox"/>	2	1	5	8
Individual Systems	<input type="checkbox"/>	<input type="checkbox"/>	40	3	12	55

Previous Select Individual Systems Update List from ControlCenter Submit Next

Figure 76 SAN Advisor Select Fabrics page

3. Selects the appropriate checkbox to choose the fabrics to include in the snapshot. Additional devices are accessible by clicking **Select Individual Systems**.

EMC recommends taking snapshots of either an individual fabric or two fabrics that mirror each other. Because SAN Advisor uses high-availability rules, it is important to take snapshots of mirrored fabrics for these rules to execute. If fabrics are not mirrored, EMC recommends creating a separate definition for each fabric.

4. When finished, clicks **Next**.

The **Match to EMC Support Matrix** page appears (Figure 77).

Snapshot Definition Name: Corp SAN

ControlCenter Host **Match To EMC Support Matrix** Select Fabrics Take Snapshot Schedule Snapshots Report

Show: All Items necessary for: Full [ESM validation](#) [Show Items](#) [What is ESM Matching?](#) [Why should I Match?](#) [Contribute Matching](#)

	Managed Object	Item Type	Matched	Matched To	Snapshot Value	Match Method
<input type="checkbox"/>	Windows Hosts					
<input type="checkbox"/>	Arrays					
<input type="checkbox"/>	Switches					

Previous Submit Next

Figure 77 SAN Advisor Match To EMC Support Matrix page

5. Matches the items that do not match the *EMC Support Matrix* components. Matching associates a collected snapshot value with an *EMC Support Matrix* component and allows SAN Advisor to validate each components' interoperability based on *EMC Support Matrix* information:
- a. Expands the items in the Managed Object column to see all system names.
 - b. Clicks **Show Items** and displays all items that require matching.
 - c. To match an item, the administrator clicks its link in the **Matched To** column and navigates the menus to select the correct description as shown in [Figure 78](#).

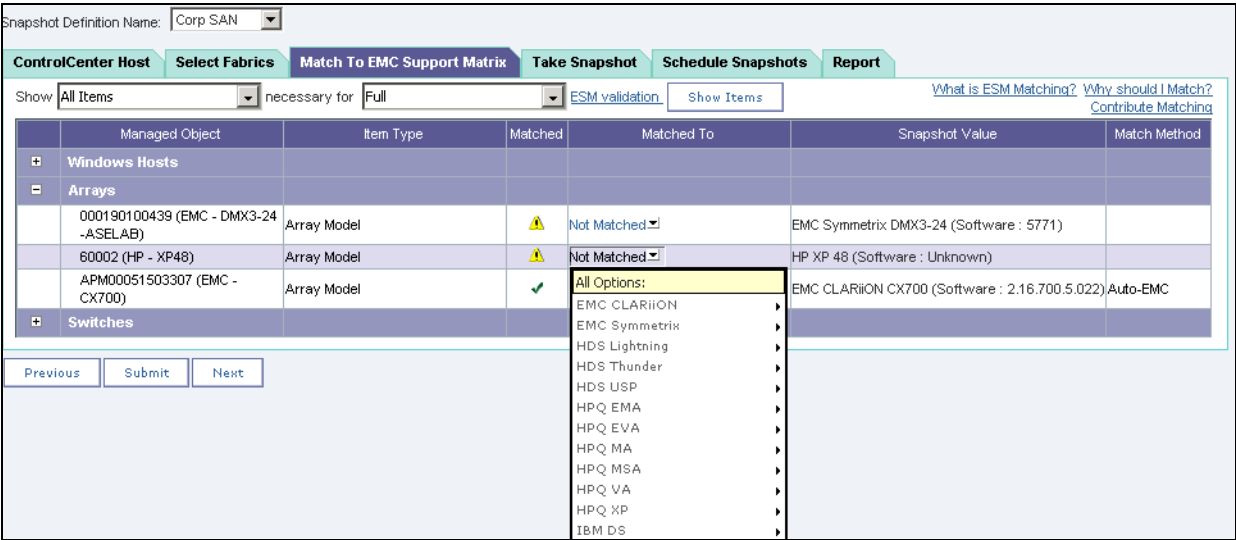


Figure 78 Matching snapshot values to EMC Support Matrix components

d. When finished, clicks **Next**. The **Take Snapshot** page appears (Figure 79).

Snapshot Definition Name: Corp SAN

ControlCenter Host

Select Fabrics

Match To EMC Support Matrix

Take Snapshot

Schedule Snapshots

Report

Managed Object

Windows Hosts

Arrays

Switches

Previous

Start Snapshot Now

Next

Figure 79 SAN Advisor Take Snapshot page

6. Clicks **Start Snapshot Now** to begin the snapshot process. SAN Advisor confirms when the snapshot is complete.

Note: You can use the Schedule Snapshots page to define how often SAN Advisor takes an environment snapshot. You can use the Report page to define who receives snapshot reports. SAN Advisor sends reports using email after a scheduled snapshot is finished.

The completed snapshot appears on the SAN Advisor home page in the Snapshot Definitions and Snapshots section as shown in Figure 80.

New Design

Name:

Go

Getting Started? >>

My Designs

Upload Design

Delete

Name	Creation Date	Last Saved Date	Status	Action
Corp SAN-Snapshot1	Jan 30, 2008 4:14:41 PM EST	Jan 31, 2008 1:50:50 AM EST	Invalid(out of date)	Rename Save File Copy Delete

New Snapshot Definition

Name:

Go

Snapshot Definitions and Snapshots

Show Snapshots All

Snapshot Definition	Snapshot	Creation Date	Baseline	Status	Action
CorpSAN	Latest		<input checked="" type="radio"/>	2 Valid, 2 Invalid	Rename Copy Delete
	CorpSAN-Snapshot4	Mar 28, 2007 3:01:53 AM EDT	<input type="radio"/>	Valid	Save File Rename Copy to My Designs Delete
	CorpSAN-Snapshot3	Mar 27, 2007 3:01:53 AM EDT	<input type="radio"/>	Valid	Save File Rename Copy to My Designs Delete
	CorpSAN-Snapshot2	Mar 26, 2007 3:01:54 AM EDT	<input type="radio"/>	Invalid	Save File Rename Copy to My Designs Delete
	CorpSAN-Snapshot1	Mar 26, 2007 3:01:53 AM EDT	<input type="radio"/>	Invalid	Save File Rename Copy to My Designs Delete

Figure 80 Completed snapshot appears on SAN Advisor Home page

7. Views the snapshot. All error, warning, or informational messages associated with the SAN environment are displayed in the Overview report. The Overview report contains design messages, diagrams, and tables that contain component details.

Clicks the snapshot name, and then clicks **View Report** to view the Overview report.

- 8. Edits the snapshot to model changes or resolve problems, if necessary.
- 9. Clicks the snapshot name, and then clicks **Make Copy and Edit**. The snapshot is copied to the My Designs section so that it can be edited. The snapshot is now a design.

Modeling proposed SAN changes

The SAN design created in [“Validating an existing SAN environment” on page 102](#) provides a baseline against which SAN changes can be modeled.

Resolving the availability problem

The Overview report displays a warning message which shows an availability problem on host losbd205. Two connections to the same switch in the fabric are discovered, as shown in [Figure 81](#).

Warning (1)

1. **High availability to switch** [Edit Rule: 6003] ?

losbd205 has all 2 of its ED-10000M-6064 connections connected to the same switch (Mesh A/ED-10000M). For high availability, it is recommended that you spread connections across multiple switches within the fabric.

Figure 81 Overview Report: availability problem

Note: To run an Overview report, set this option from the snapshot setup page as show in [Figure 82](#).

Snapshot Definition Name: CorpSAN

Current Baseline is: CorpSAN-Snapshot4Change Baseline

ControlCenter Host

Select Fabrics

Match To EMC Support Matrix

Take Snapshot

Schedule Snapshots

Report

From: sacd_admin@emc.com (admin)

Recipient's Email	Message	Excel	SAN File	Compare Report	
				Overview	Pa
sacd_admin@emc.com (admin)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Previous

Submit

Run Report Now

Figure 82 Report Selection - “Overview” is checked

To resolve the availability problem, the administrator:

1. On the **SAN Advisor** home page, under **Snapshot Definitions** and **Snapshots**, locates the appropriate snapshot and clicks **Copy to My Designs**.
The snapshot (now a design) moves to My Designs, so that it can be edited.
2. Under **My Designs**, clicks the design to edit it.
3. On the page that appears, selects **Tools, Connections** from the top navigation bar.

The **Connections** page appears showing the two connections to the same switch in the fabric ([Figure 83](#)).

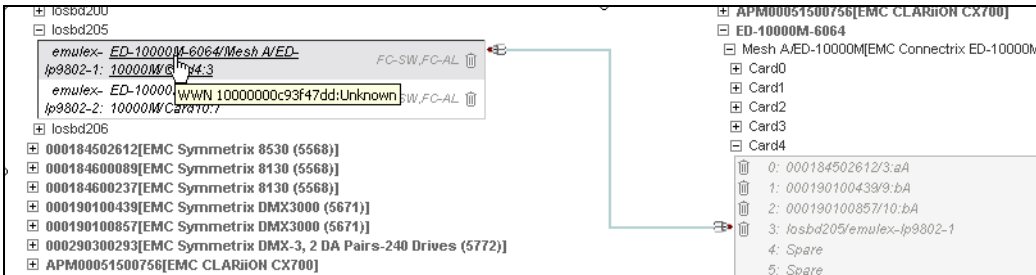


Figure 83 Availability problem: two connections to the same switch

4. Opens Card 10 Port 7 of the Connectrix® ED-10000M and clicks the **trash can** icon next to losbd205 to disconnect it from the host (Figure 84).

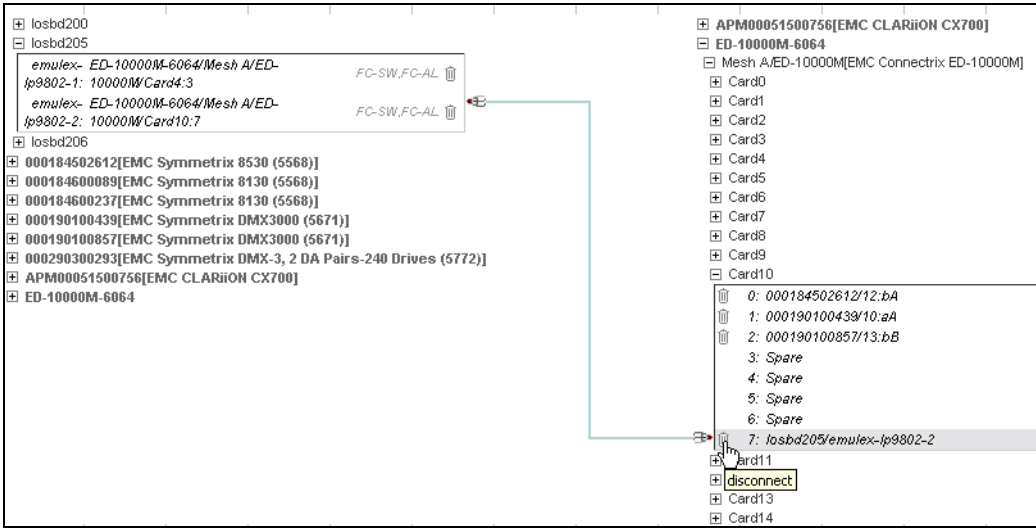


Figure 84 Disconnecting the host from the switch

5. Opens another switch and finds a spare port to connection for the host (Figure 85).

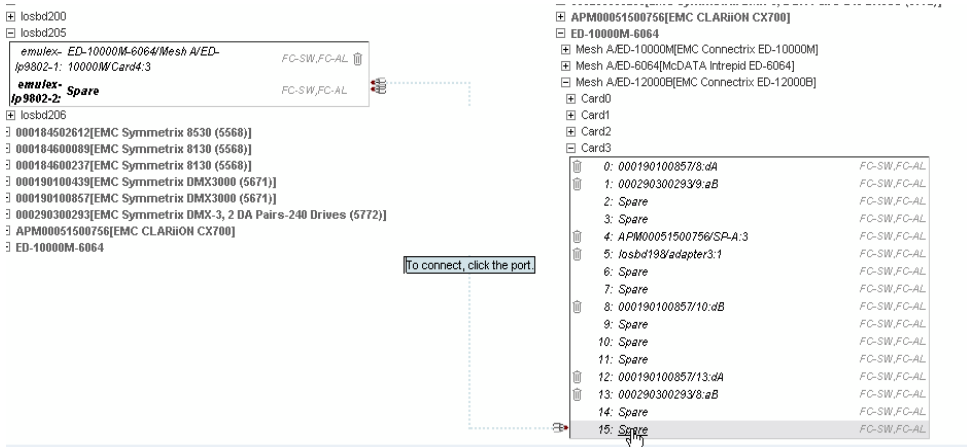


Figure 85 Reconnecting the host to different switch

6. Clicks the submit button to send changes (Figure 86).

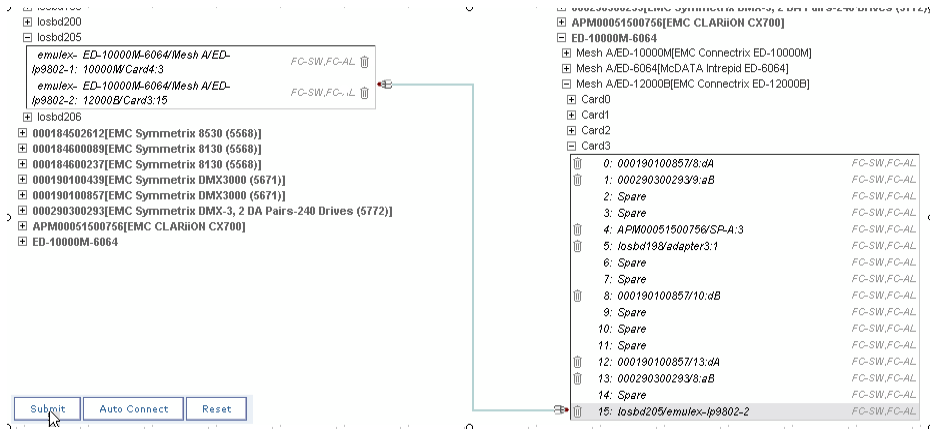


Figure 86 Submitting changes

7. If changes are accepted then warning message is cleared from the snapshot.

Resolving an interoperability problem

The Overview report also shows that an interoperability problem exists on host cawti (Figure 87). Two HBAs from different vendors are present. EMC recommends that both HBAs be from the same vendor.

Error			
1. According to the EMC Support Matrix 'Base Connectivity' section, the following HBA-driver-firmware combinations are not qualified.			
Server	HBA	Driver	Firmware
cawti	LP8000-EMC	2.23a6	3.20x4
cawti	QLA2310F-E-SP	6.04.01	Unknown
[Message 5103] ?			

Figure 87 Overview Report: driver/firmware qualification issues

To resolve the interoperability problem, the administrator:

1. In the object tree, under **Hosts**, clicks host cawti, and displays the host's summary report.

2. Clicks the **Host Information** tab to view the HBA driver and firmware combination that is incorrect (Figure 88). SAN Advisor displays an icon to show components that do not interoperate with each other.

Host Type: Single Host ☒ Show Interoperability Icons (Up to date)

Host Name: cawti

Host Information | Path Details | Storage Requirements | Custom Fields

[Boot from Array](#) ☐ Yes

Host Vendor: Dell Host Model: PowerEdge 2400

OS Vendor: Microsoft OS Version: Windows 2000 Advanced Server SP4

HBA Name	HBA Vendor	HBA Model	HBA Driver	HBA Firmware	Ports	Port Speed	Port Type	
HBA1	Emulex	LP8000-EMC	2.02e	3.90a7	1	1	Gbps FC-AL,FC-SW	
HBA2	QLogic	QLA2310F-E-SP	4.15.05	Not Applicable	1	2	Gbps FC-AL,FC-SW	

Infrastructure Software Vendor: EMC Infrastructure Software Version: PowerPath 4.3.1

[Add HBA](#)

[Submit](#) [Add Another Host](#) [Reset](#) [Delete](#)

Figure 88 Host Information page showing incompatible components

3. Clicks the **trash can** icon on the right side of the screen to delete the QLogic HBA.
4. Selects the correct HBA driver and firmware for the Emulex HBA from the menu (Figure 89).

Host Type: Single Host ☒ Show Interoperability Icons (Up to date)

Host Name: cawti

Host Information | Path Details | Storage Requirements | Custom Fields

[Boot from Array](#) ☐ Yes

Host Vendor: Dell Host Model: PowerEdge 2400

OS Vendor: Microsoft OS Version: Windows 2000 Advanced Server SP4

HBA Name	HBA Vendor	HBA Model	HBA Driver	HBA Firmware	Ports	Port Speed	Port Type	
HBA1	Emulex	LP8000-EMC	2.40a2	3.92a2	1	1	Gbps FC-AL,FC-SW	

Infrastructure Software Vendor: EMC Infrastructure Software Version: PowerPath 4.3.1

[Add HBA](#)

[Submit](#) [Add Another Host](#) [Reset](#) [Delete](#)

Figure 89 Selecting the correct HBA firmware

5. Clicks the **Add HBA** button to replace the deleted QLogic HBA with another Emulex HBA (Figure 90).

This ensures that HBAs are from the same vendor, because, by default, the new HBA will be the same as the existing HBA. Now the HBA driver and firmware for both HBAs are of a qualified combination.

The screenshot shows the 'Host Information' tab in the SAN Advisor interface. At the top, 'Host Type' is set to 'Single Host' and 'Host Name' is 'cawtl'. A checkbox for 'Show Interoperability Icons' is checked. Below the tabs, there are fields for 'Host Vendor' (Dell), 'Host Model' (PowerEdge 2400), 'OS Vendor' (Microsoft), and 'OS Version' (Windows 2000 Advanced Server SP4). A table lists two HBAs, HBA1 and HBA2, both with 'Emulex' vendor, 'LP8000-EMC' model, '2.40a2' driver, and '3.92a2' firmware. Each has 1 port at 1 Gbps with 'FC-AL, FC-SW' port type. At the bottom, 'Infrastructure Software Vendor' is 'EMC' and 'Infrastructure Software Version' is 'PowerPath 4.3.1'. An 'Add HBA' button is visible on the right. At the very bottom are 'Submit', 'Add Another Host', 'Reset', and 'Delete' buttons.

HBA Name	HBA Vendor	HBA Model	HBA Driver	HBA Firmware	Ports	Port Speed	Port Type
HBA1	Emulex	LP8000-EMC	2.40a2	3.92a2	1	1 Gbps	FC-AL, FC-SW
HBA2	Emulex	LP8000-EMC	2.40a2	3.92a2	1	1 Gbps	FC-AL, FC-SW

Figure 90 Qualified HBA combination

By detailing the existing configuration, the administrator can easily add individual or multiple components and test their interoperability as shown next in [“Adding components to the existing configuration”](#) on page 114.

Customizing configuration rules

Optionally, if the administrator wants to comply with internal business recommendations, rather than complying with the *EMC Support Matrix*, the administrator can edit the configuration rules, for example, to apply or not apply to certain objects.

To edit a configuration rule, the administrator:

1. On the **SAN Advisor** home page, under **My Designs**, clicks the desired design.

The **Host Information** page appears.

2. On the **Tools** menu, selects **Edit Rule Set** and displays the Rule Set page containing a list of all configuration rules (Figure 91).

Rule Set (Saved by admin on Feb 14, 2008 1:21:30 PM EST version 1.9)

Manage rules in category for object type

0 Selected Displaying 159 of 159 Rules

<input type="checkbox"/> All	Rule ID	Category	Rule Name	Configurable	Object Type	Severity	State	Condition
<input type="checkbox"/>	2001	Availability	Infrastructure software not installed	No	Host	Info	Enabled	No
<input type="checkbox"/>	2101	Host Configuration	Cluster nodes are running different versions of infrastructure software	No	Host	Warning	Enabled	No
<input type="checkbox"/>	2111	Host Configuration	Different versions of cluster software running	No	Host	Warning	Enabled	No
<input type="checkbox"/>	2107	Host Configuration	Different HBAs on host	No	Multiple	Warning	Enabled	No
<input type="checkbox"/>	2108	Availability	No logical path between host and storage device	No	Multiple	Error	Enabled	No
<input type="checkbox"/>	2109	Availability	Missing masking for zoned HBA ports	No	Host	Warning	Enabled	No
<input type="checkbox"/>	2200	Availability	Unprotected storage requirement	No	Host	Warning	Enabled	No
<input type="checkbox"/>	2201	Host Configuration	Unassigned storage requirement	No	Host	Error	Enabled	No
<input type="checkbox"/>	2203	Array Configuration	Unsupported protection	No	Host	Warning	Enabled	No

Figure 91 Rule Set page

3. Selects the checkbox next to the rule to edit and clicks **Edit Conditions** and displays the Rule Conditions page for the selected rule (Figure 92).

Rule ID: 2001 **Category:** Availability
Rule Name: Infrastructure software not installed **Applies to Objects:** Host
Description: Reports hosts are not running infrastructure software when there is a qualified version.

Conditions **Messages**

Object	Attribute	Operator	Value
Select Object	Select Object First	Select Attribute First	Select Operator First

Figure 92 Editing rule conditions

4. On the **Conditions** tab, from the pull-down menu, selects **Enable Rule When**, which activates the pull-down menus below it.
5. Selects the following for the four pull-down menus, so that the rule will only apply to Windows hosts:

- Object — Host
- Attribute — OS Vendor
- Operator — equals
- Value — Microsoft

6. Clicks **Apply to Rule Set** to apply the changes.

Adding components to the existing configuration

The administrator wants to add a new host to the existing configuration. Using the baseline established in [“Validating an existing SAN environment” on page 102](#), the administrator can now model the new components.

To add a new storage requirement and host, the administrator:

1. Copies and edits the appropriate design from the **SAN Advisor** home page. The **Server** page appears showing the Storage Requirements fields.
2. Selects **New > Host** or clicks the **Add Another Host** button and enters the new storage requirement information, which includes new hostname (New Server), requirement name, target platform, protection, and capacity ([Figure 93](#)).

The screenshot shows the SAN Advisor web interface. At the top, 'Host Type' is set to 'Single Host' and 'Host Name' is 'New Server'. There is a checkbox for 'Show Interoperability Icons (Up to date)'. Below this are tabs for 'Host Information', 'Path Details', 'Storage Requirements', and 'Custom Fields'. The 'Storage Requirements' tab is selected, showing a table with one requirement. The table has columns for 'Requirement Name', 'Target Platform', 'Protection', and 'Capacity (GB)'. The requirement 'Requirement0' has a target platform of 'EMC CLARION CX400/CX600', protection of 'RAID-5 (4+1)', and capacity of 'Usable 100'. At the bottom right of the table is an 'Add Requirement' button. At the bottom of the form are 'Submit', 'Add Another Host', and 'Reset' buttons.

Requirement Name	Target Platform	Protection	Capacity (GB)
Requirement0	EMC CLARION CX400/CX600	RAID-5 (4+1)	Usable 100

Figure 93 Defining a new storage requirement

3. When finished, clicks the **Host Information** tab. The **Host Information** fields appear.
4. Enters the new host information, which includes host model, operating system, and HBAs ([Figure 94](#)).

Host Type
Single Host
Show Interoperability Icons (Up to date)

Host Name
New Server

Host Information
Path Details
Storage Requirements
Custom Fields

[Boot from Array](#)
☐ Yes

Host Vendor
Sun
Host Model
Ultra 220R

OS Vendor
Sun
OS Version
Solaris 9

HBA Name	HBA Vendor	HBA Model	HBA Driver	HBA Firmware	Ports	Port Speed	Port Type	
HBA1	QLogic	QLA2340-E-SP	4.15.03	Not Applicable	1	2 Gbps	FC-AL FC-SW	⚠️ ⓘ
HBA2	QLogic	QLA2340-E-SP	4.15.03	Not Applicable	1	2 Gbps	FC-AL FC-SW	⚠️ ⓘ

Infrastructure Software Vendor
EMC
Infrastructure Software Version
PowerPath 4.3.1

Add HBA

Submit
Add Another Host
Reset

Figure 94 Defining a new host

For detailed information on the fields in the Host Information page, click the SAN Advisor online help icon in the top-right corner of the page.

As you add and define components, SAN Advisor continuously checks their interoperability against the latest *EMC Support Matrix* data and indicates any incompatibility issues. If an incompatibility is found, an icon appears to warn of an invalid configuration.

When finished, clicks **Submit**. The new host is now added.

5. Selects **Tools > Connections**. The **Connections** page appears (Figure 95). A red flag next to the new hostname indicates that the host is not yet connected.

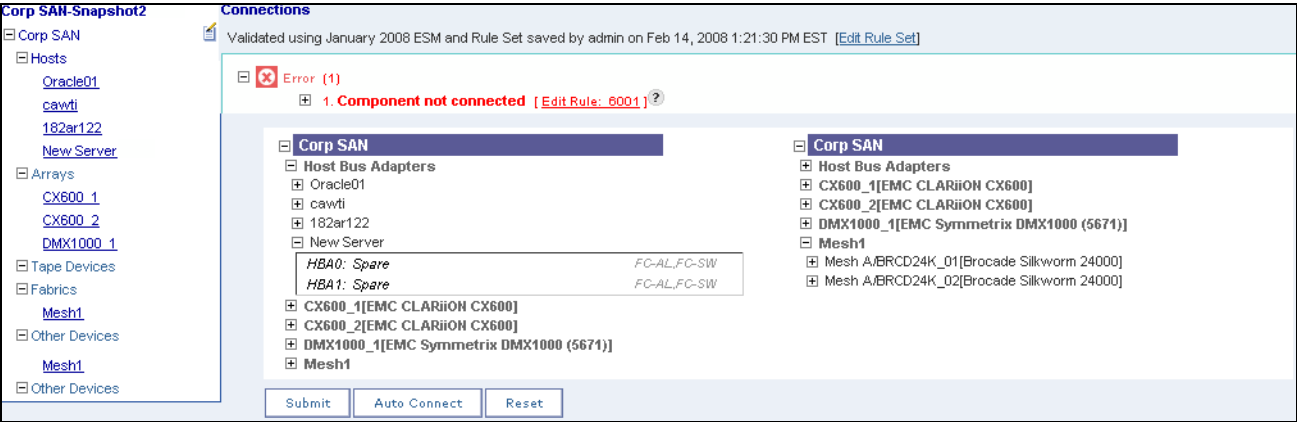


Figure 95 SAN Advisor Connections page

6. To connect the new host's HBA ports to the fabric, expands the new host on the left (New Server) and expands the switch on the right.
7. Clicks one end of the connection, then the other end of the connection to connect the two points. A connection is shown in Figure 96.

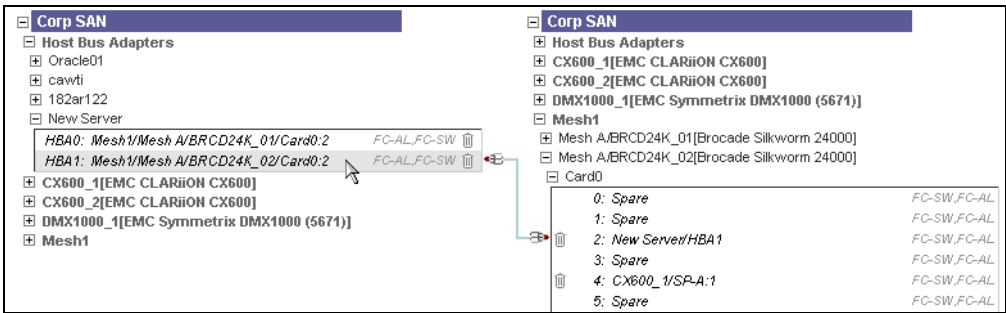


Figure 96 Connecting the new host's HBA port

8. When finished, clicks **Submit**.

The new host is now connected as shown in Figure 97.

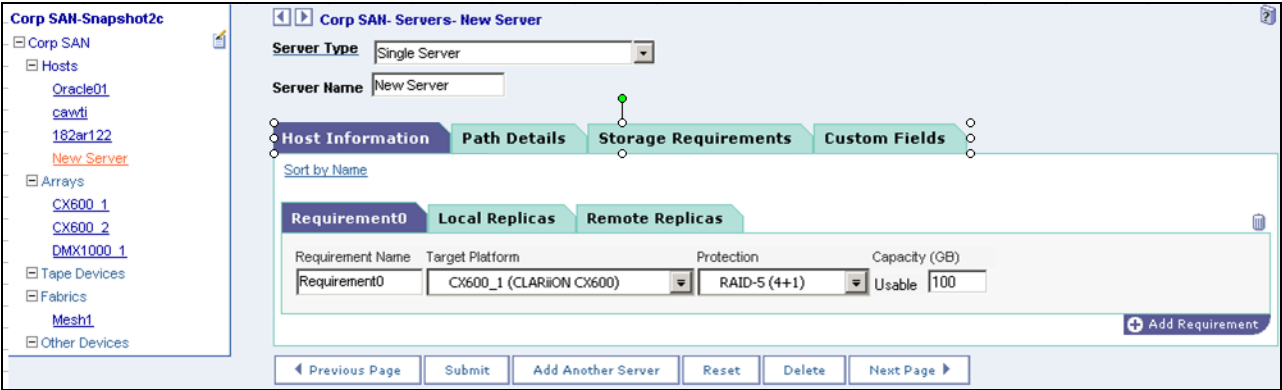


Figure 97 The new host is connected

The administrator can now compare the designs and verify whether the new host was added correctly as shown in [“Building an action plan” on page 117](#).

Building an action plan

Building an action plan consists of comparing snapshots and correcting any problems found. The administrator compares the original snapshot with the new design.

To complete this task, the administrator:

1. Navigates to the SAN Advisor home page.
2. In the **Compare** column, checks the original design snapshot and the new design snapshot ([Figure 98](#)).

● **New Design** Name: [Getting Started? >>](#)

My Designs

Name	Creation Date	Last Saved Date	Status	Action
Corp SAN-Snapshot2	Sep 5, 2006 12:48:15 PM EDT	Sep 5, 2006 12:48:15 PM EDT	Invalid	Rename Save File Copy Delete <input type="checkbox"/>
Corp SAN-Snapshot1	Aug 4, 2006 6:08:11 PM EDT	Sep 1, 2006 6:15:28 PM EDT	Invalid	Rename Save File Copy Delete <input type="checkbox"/>

● **New Snapshot Definition** Name:

Snapshot Definitions and Snapshots Show Snapshots:

Snapshot Definition	Snapshot	Creation Date	Status	Action
[-] Corp SAN			0 Valid, 4 Invalid	Rename Copy Delete
	Snapshot3	Sep 5, 2006 11:59:24 AM EDT	Invalid	Save File Rename Copy to My Designs Delete <input type="checkbox"/>
	Snapshot2	Jul 25, 2006 1:22:21 PM EDT	Invalid	Save File Rename Copy to My Designs Delete <input type="checkbox"/>
	Snapshot1	Jul 20, 2006 11:55:18 AM EDT	Invalid	Save File Rename Copy to My Designs Delete <input type="checkbox"/>

Summary for all 0 Valid, 5 Invalid

Figure 98 Selecting snapshots for comparison

3. Clicks **Compare**. The newly added host should be the only difference seen in these designs (Figure 99).

Snapshot2	Corp SAN-Snapshot2
[Last Saved Date: Aug 04, 2006 18:06] Validated using July 2006 ESM and Rule Set saved by admin on Jul 25, 2006 4:08:40 PM EDT version 1.1 Product Version: 5.3 Status: Invalid	[Last Saved Date: Sep 05, 2006 11:59] Validated using July 2006 ESM and Rule Set saved by admin on Jul 25, 2006 4:08:40 PM EDT version 1.1 Product Version: 5.3 Status: Invalid
Site	Site
Corp SAN	Corp SAN
Host	Host
	+ New Server
	+ Sun Ultra 220R
	+ External Boot : No
	+ Sun Solaris 8
	+ Fail-Over
	+ EMC PowerPath 4.3.1
	+ Storage Requirement
	+ Requirement0
	+ Target Platform : EMC CLARiiON CX400/CX600
	+ Accessed Storage : CX600_1
	+ Storage Type : Primary
	+ Protection : RAID-5 (4+1)
	+ Capacity (GB) : 100.0

Figure 99 Compare report showing newly-added host

Implementing changes

Using SAN Advisor’s Compare Report as a guide to install, connect, and configure the new host and storage requirement, the administrator should verify that:

- ◆ The host contains all required software, HBAs, and drivers.
- ◆ The host can connect to the storage array where its storage requirement resides.
- ◆ The storage requirement is protected by the appropriate RAID level.
- ◆ The storage requirement has the required local and remote replicas.

Verifying correct plan information

To verify that the changes are correct, the administrator:

1. Takes a second snapshot of the Ionix ControlCenter environment where the host was added, as described in [“Validating an existing SAN environment” on page 102](#).
2. Checks the appropriate snapshots for comparison, and clicks **Compare**, as described in [“Building an action plan” on page 117](#).
3. Compares the snapshot to the design containing the recently modeled changes. If the new host was implemented correctly, the Compare Report will not contain any differences ([Figure 100](#)).

New Snapshot2	Corp SAN-Snapshot2
Last Saved Date: Sep 6, 2006 10:30	Last Saved Date: Sep 6, 2006 10:30
Validation based on April 2006 EMC Support Matrix	Validation based on April 2006 EMC Support Matrix
Product Version: 5.3	Product Version: 5.3
Status: Valid	Status: Valid
Site	Site
Host	Host
Storage	Storage
Fabric	Fabric

Figure 100 Comparing snapshots

Allocating storage to a host from a Symmetrix array

This example demonstrates adding additional storage from a Symmetrix array to a new Sun Solaris database host (l82ar156) that has been added to the datacenter.

An Oracle DBA has requested 40 GB of RAID 1 storage with local replica for the new database host. The system administrator determines that they need to find and allocate a total of 120 GB of space (40 GB for the standard devices, 40 GB for the mirror devices, and 40 GB for the BCV devices) to meet their RAID protection and local replica business requirements.

The host and the Symmetrix array are physically connected to the same fabric as shown in [Figure 101](#).

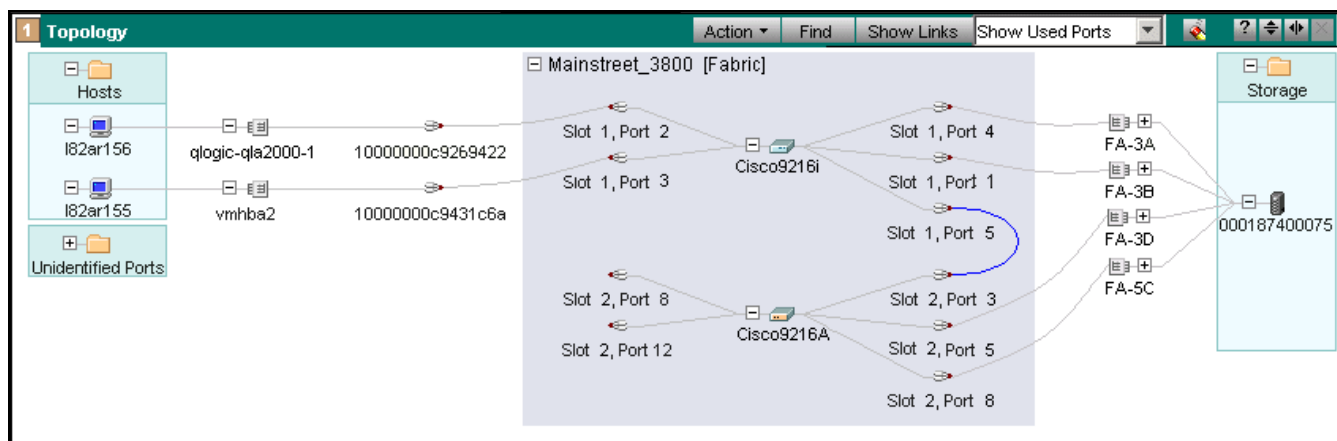


Figure 101 New database host l82ar156 added to the environment

Determining if there is enough storage on the Symmetrix array

The system administrator needs to find and allocate a total of 120 GB of storage for the new database host. The administrator creates a custom StorageScope report to determine the amount of configured, allocated, and unconfigured storage available on this array.

The administrator uses the most up-to-date data for generating the StorageScope reports used in this section. Otherwise, the administrator could be basing device allocation on old data that is no longer valid for this configuration.

To do this, the administrator:

1. Opens a web browser window and enters the following URL:

https://<StorageScope host name>:30002/srm

where `<StorageScope_host_name>` is the name of the host on which StorageScope is installed.

2. Enters the Ionix ControlCenter login. The dashboard appears.
3. On the **StorageScope** menu, selects **Analysis > Queries > Query Builder**.
4. Selects **Create** to launch the **Query Builder Wizard**.

Note: For detailed instructions on using the Query Builder Wizard, refer to the StorageScope online help.

5. On the **Define Initial Settings** step of the wizard, sets **Name**, **Description**, and **Time Period** settings for the query ([Figure 102 on page 121](#)).
6. Since the query will be returning data based on the present configuration of the managed environment, selects **Current Data**.

1. Define Initial Settings

Steps: 1 > 2 > 3 > 4 > 5 >

Set identification information for the query and choose a period of time for which the query will return data.

The screenshot shows the 'Define Initial Settings' step of the Query Builder Wizard. The form is divided into several sections:

- Name:** A text box containing 'unconfigured symm capacity'.
- Description:** A text box containing 'unconfigured capacity of symm 000187400075'.
- Query Categories:** A dropdown menu with 'Capacity Planning' selected.
- Select Time Period for Data:** Two radio buttons are present: 'Current Data' (selected) and 'Historical Data'. Below 'Historical Data' are options for 'Date Range' (From: 12/01/2009, to: 12/01/2009) and 'Time Period' (Last Week).
- Select Objects to include:** A dropdown menu with 'Current objects only' selected.
- Select Frequency:** A dropdown menu with 'Daily Values (up to 42 days)' selected.

Figure 102 Define Initial Settings step of the query builder

7. Clicks **Next** to move to the **Areas of Interest** page of the query wizard ([Figure 103](#)).
8. On the **Areas of Interest** page, selects **Arrays** from the **Arrays** grouping.

2. Select one to eight related Areas of Interest Steps: 1 > **2** > 3 > 4 > 5 > 6

Choose categories of information on which the query will return data. You can only select related areas of interest, as you select categories, unrelated categories will be de-activated.

Hosts

- ☐ Hosts
- ☐ Chargeback
- ☐ Host Devices
- ☐ Shared Devices
- ☐ HBAs
- ☐ Host Ports
- ☐ Host Arrays
- ☐ Volume Groups
- ☐ Logical Volumes
- ☐ File Systems
- ☐ Components
- ☐ Groups
- ☐ ESX Server
- ☐ VM Machine
- ☐ VM File

Connectivity

- ☐ Switches
 - ☐ Switch Ports
- ☐ Port Connections
- ☐ Fabrics
- ☐ Active Zone Sets
- ☐ Active Zone Set Members
- ☐ Unzoned End Ports
- ☐ Groups

Arrays Clear all

- ☒ Arrays
- ☐ LUNs
- ☐ Meta Devices
- ☐ Device Allocation
- ☐ Disks
- ☐ Array Ports
- ☐ Port Connections
- ☐ LUN Masking
- ☐ Masking view
- ☐ Replicas
- ☐ RAID Groups
- ☐ Storage Groups
- ☐ Storage Pools
- ☐ Groups
- ☐ Pools

Virtual Storage

- ☐ Virtual Storage
- ☐ Virtual Disk
- ☐ Virtual Device

< Back
Next >
Cancel
Help

Figure 103 Areas of Interest step of the query builder

9. Clicks **Next** to move to the **Select Columns** page of the query wizard (Figure 104).

10. Adds the following columns to the query:

- Arrays.Array Name
- Arrays.Array S/N
- Arrays.Array Type
- Arrays.Array Vendor
- Arrays.Array Model
- Arrays.Array Cache
- Arrays.Physical Capacity
- Arrays.Unconfigured
- Arrays.Configured
- Arrays.#Cache Slots

- Arrays.#LUNs
- Arrays.#Array Ports
- Arrays.#Disks
- Arrays.Last Power On
- Arrays.Symmetrix Family

3. Select Columns

Steps: 1 > 2 > **3** > 4 > 5 > 6

Select database columns to be used in the query, the list of available columns depends on the objects selected in the previous step. You can also set display aliases for columns and create custom, calculated columns based on existing columns.

Figure 104 Select Columns step of the query builder

Note: The columns listed above containing the appellation “UDF” are Ionix ControlCenter User-Defined Fields. User-Defined Fields are custom fields created by the user and are specific to the user’s environment. UDF fields listed in this document are merely examples of custom fields a user may wish to add as attributes for managed objects in their environment, they will neither exist in your Ionix ControlCenter installation nor be shown in figures in this document. For more information about working with User-Defined Fields, refer to the Ionix ControlCenter online help or to the *EMC Technical Note Using Custom Fields in StorageScope Queries*.

11. Clicks **Next** to go to the **Create Filters** step of the query wizard (Figure 105).
12. Creates a filter for the array of interest as follows:
13. Under **Column Name** selects “Arrays.Array Name”.
14. Under **Operator** selects “equal to”.
15. Under **Value** enters “000187400075”, which is the name of the symmetrix array of interest.

4. Create Filters

Steps: 1 > 2 > 3 > 4 > 5 > 6

Filter the results of the query based on the value of selected database columns. You can create nested filters using "and/or" structures and parenthetical groupings.

	Column Name	Operator	Value	
<input type="checkbox"/>	Arrays.Array Name	equal to	000187400075	<input type="checkbox"/>
<input type="checkbox"/>	Select a column			<input type="checkbox"/>
<input type="checkbox"/>	Select a column			<input type="checkbox"/>
<input type="checkbox"/>	Select a column			<input type="checkbox"/>
<input type="checkbox"/>	Select a column			<input type="checkbox"/>

Figure 105 Create Filters step of the query builder

16. Clicks **Next** to go to the **Select Sorting, Grouping & Total Options** step of the query wizard.
17. Leaves the default options in place and clicks **Next** to go to the **Select Run Settings** step of the query wizard.
18. Chooses the default output options for the query and clicks **Save** to save the query.

Note: If this Query is likely be run again in the future; EMC recommends saving it for later use.

- Clicks **Run Now** to run the query. The query output lists only the array of interest (Figure 106).

Query Results

Query Name: Array Configuration_
 Run Time 2006-09-27 16:06 (GMT-04:00) [View SQL](#)

1 row - Page 1 of 1

Array Name	Array S.N	Array Type	Array Vendor	Array Model	Array Cache	Physical Capacity (KB)	Unconfigured (KB)	Configured (KB)	Allocated (KB)	# Cache Slots	# LUNs	# Array Ports	# Disks	Last Power On	Symmetrix Family
000187400075	000187400075	Symmetrix	EMC	DMX1000P	22,528	10,5524	331.64	2,635.24	2,575.61	359,268	486	62	60	2004-04-12 00:00	Symm6

Figure 106 StorageScope report showing unconfigured capacity

The report shows that there is 2635.24 GB configured, 2575.61 GB allocated, and 331.64 GB unconfigured storage available. Since the administrator needs 120 GB of storage for the new host, there is enough additional storage on this array to meet their requirements.

Determining if type of connection is available

The administrator uses the Topology view in the Ionix ControlCenter Console to verify that Fibre Channel connections to the array exist.

To determine if the required connections exist, the administrator:

- Clicks the **Topology** button on the Console toolbar.
- In the Console tree, expands the folders **Storage Systems**, **Symmetrix**. The Symmetrix arrays appear.
- Drags the array (**000187400075**) into the Topology view (Figure 107).

The administrator turned on **Show Links** to see the cabling that is in place for this fabric. The administrator is using WWN zoning and will need to create a zone and add it to the zone configuration for the Mainstreet_3800 fabric.

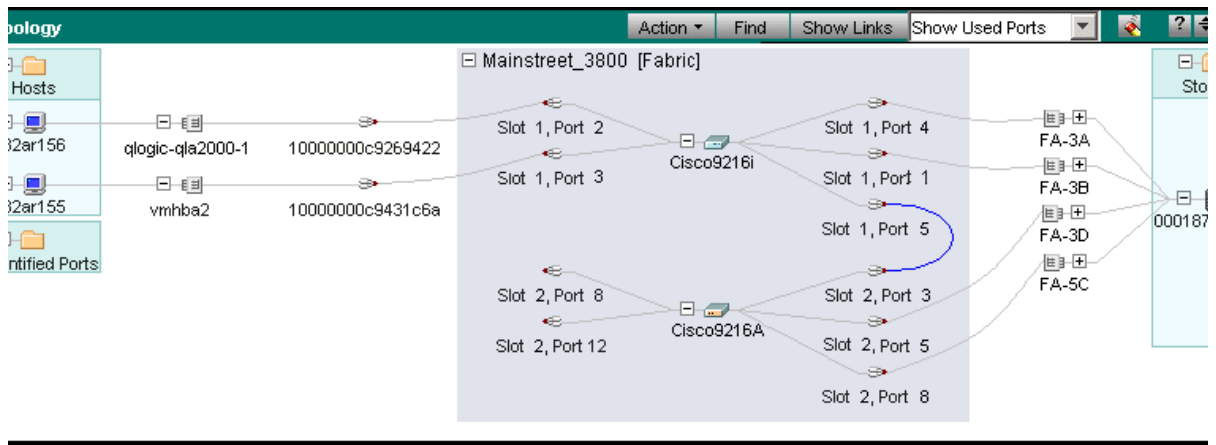


Figure 107 Determining if desired type of connection is available

The Topology view shows that Fibre Channel connectivity to the host exists.

Determining if ports that meet requirements are available

The administrator needs to determine if ports are available on the array, and if the available ports meet requirements such as fan-in ratio, I/O, devices per channel, and so on. The administrator uses the *EMC Support Matrix* available on the EMC online support website (<http://powerlink.emc.com>) to determine if the current configuration can support the new host.

To complete this task, the administrator:

- ◆ Verifies port settings.
- ◆ Verifies fan-in ratio.
- ◆ Determines devices per channel.
- ◆ Determines port throughput.

Verifying port settings

Port flag settings on the Symmetrix array control how the array communicates with each host type. The administrator needs to select a port based on the port flag settings to ensure that the port can communicate with the HBA in the new Sun host. The most up-to-date information for port flag settings can be found in the *EMC Support Matrix* on the EMC online support website.

To do this, the administrator:

1. In the Console tree, expands the folders **Storage Systems, Symmetrix**.
2. Expands the array **(000187400075)** and the folder **Host Directors**.
3. Right-clicks **FA-3D** and selects **Port and Director Configuration, Port Flag Settings**.

The **Port Flag Default Settings** wizard appears (Figure 108 on page 127).

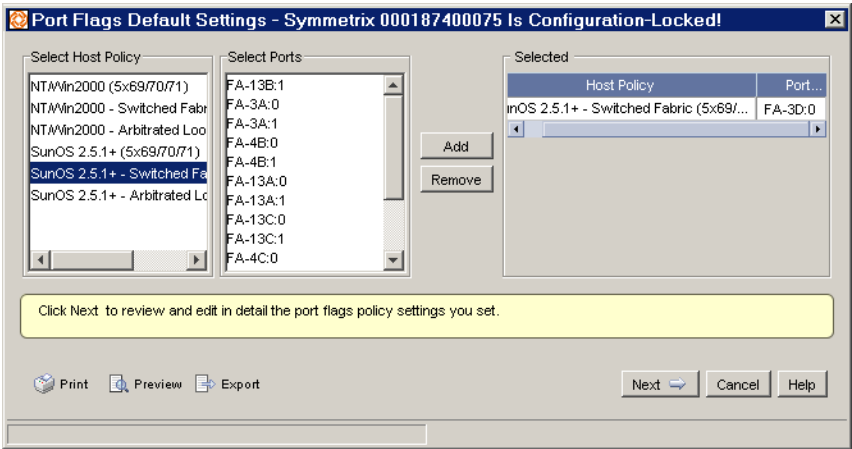


Figure 108 Port Flag Default Settings dialog box

4. Clicks **Next** and displays the next page of the wizard (Figure 109).

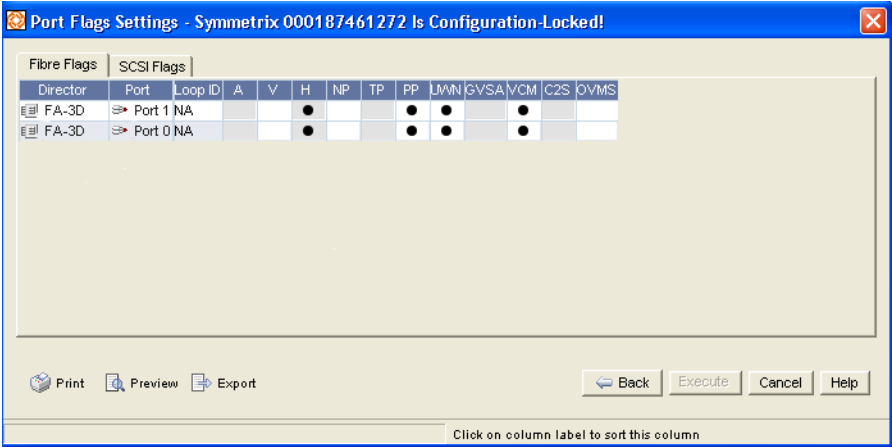


Figure 109 Port Flag Setting dialog box

5. Verifies the flag settings for the host operating system against the *EMC Host Support Matrix*.
6. Clicks **Help** and displays the online Help that describes the flag settings.
7. Clicks **Cancel** to close the wizard once the port flag settings are confirmed.

The administrator has now verified that FA-3D Port 0 and the new host HBA are compatible.

Verifying fan-in ratio

The administrator uses Path Details view to determine the number of HBAs connected to the selected Symmetrix port to ensure that the fan-in ratio stays within EMC guidelines based on the *EMC Support Matrix* on the EMC online support website.

To do this, the administrator:

1. On the Console toolbar, clicks the pull-down menu of the blue **Storage Allocation** button and selects **Path Details**.
2. In the Console tree, expands the Symmetrix array down to the director (**Storage Systems, Symmetrix Arrays, 000187400075, Host Directors, FA-3D**), and then drags **Port 0** into the target panel.

A table showing the path details for this host appears if there are HBAs zoned to this port, or, if not (as in this case), the target panel displays the message:

There are no paths to display in this view.

Determining devices per channel

The administrator uses Properties view to determine the number of devices on the selected port to ensure that the configuration stays within EMC guidelines based on the *EMC Support Matrix* on the EMC online support website.

To do this, the administrator:

1. On the Console toolbar, clicks the **Properties** view button.
2. In the Console tree, expands the Symmetrix array down to the director (**Storage Systems, Symmetrix Arrays, 000187400075, Host Directors, FA-3D**), and then drags **Port 0** into the Properties view.

The number of devices connected to the port are displayed in the **# Devices** column (Figure 110).

3. Compares the number of devices on the channel to the *EMC Support Matrix* and determines that this configuration falls within the guidelines.

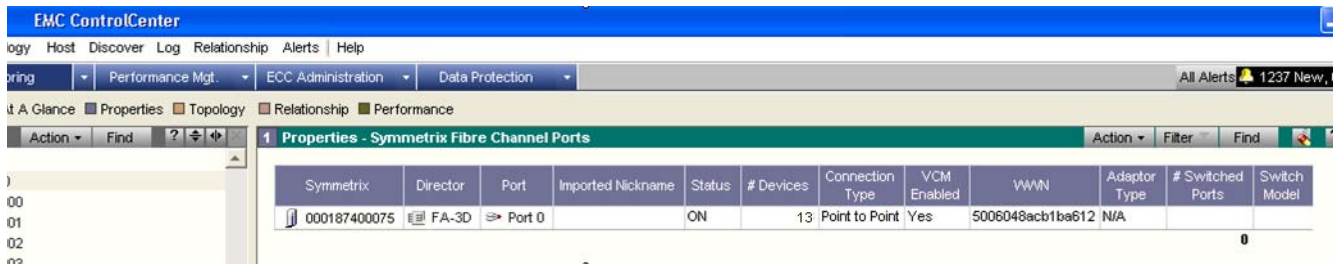


Figure 110 Using Properties view to determine the number of devices on FA-3D Port 0

Determining port throughput

FA-3D Port 0 is not a member of the active zone set. This means that it is an unused port on the Symmetrix array and has no throughput. The Performance View displays port throughput and can be used to determine if a port is unused.

[Figure 111](#) shows an example of how a port with no throughput appears in the Performance View with the Port Throughput and Port I/O both displaying a value of “0”.

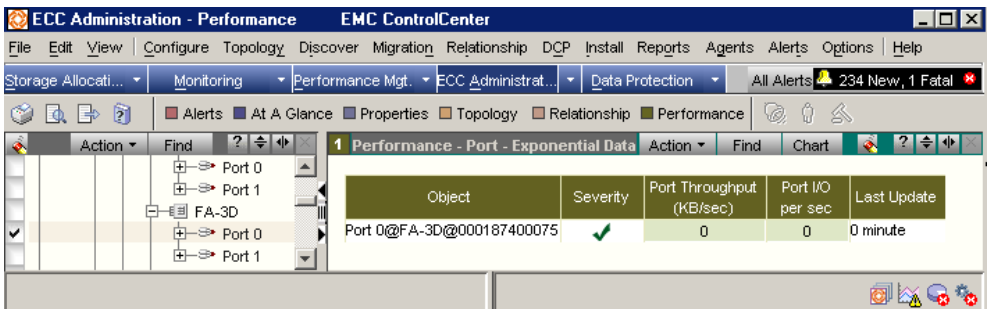


Figure 111 Using Performance view to determine the throughput on FA-3D Port 0

In situations where throughput might be an issue, the administrator can use Ionix ControlCenter Performance Manager (which is not installed in this scenario, but is demonstrated in [“Identifying a storage array performance problem” on page 64](#)) to check port throughput.

Determining if configured storage is available

The administrator uses Free Space view and Properties view to determine if configured storage is available on the Symmetrix array.

To do this, the administrator:

- 1. On the taskbar, clicks the pull-down menu on the blue **Storage Allocation** button and selects **Free Space**.
- 2. In the Console tree, expands the folders **Storage Systems, Symmetrix**, and selects the checkbox beside Symmetrix array 000187461272.

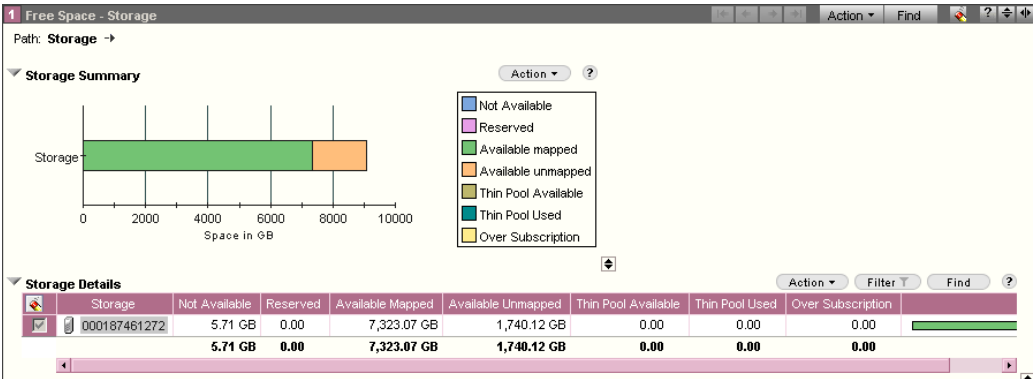
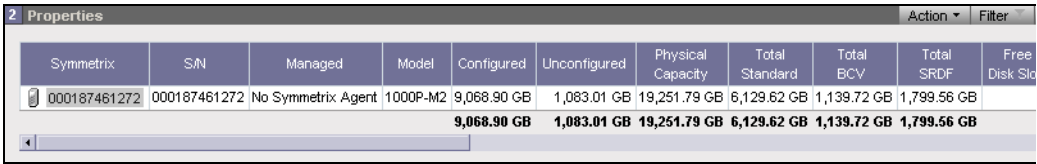


Figure 112 Free Space view showing available unmapped storage

The Free Space view shows that there is not enough available unmapped storage. The administrator will configure additional storage on this array to meet their requirements.

The administrator now splits the target panel horizontally using **Alt-Shift-h**, clicks the **Properties** view button, and drags the array into the Properties view to confirm that unconfigured storage is available on the array (Figure 113). There is 331.64 GB of unconfigured storage available.



The screenshot shows a 'Properties' window with a table of storage information. The table has columns for Symmetrix, SN, Managed, Model, Configured, Unconfigured, Physical Capacity, Total Standard, Total BCV, Total SRDF, and Free Disk Space. The data row shows a Symmetrix array with SN 000187461272, managed by 'No Symmetrix Agent', model '1000P-M2', with 9,068.90 GB configured and 1,083.01 GB unconfigured. The total physical capacity is 19,251.79 GB, and the total standard capacity is 6,129.62 GB. The total BCV is 1,139.72 GB, and the total SRDF is 1,799.56 GB. The free disk space is 1,799.56 GB.

Symmetrix	SN	Managed	Model	Configured	Unconfigured	Physical Capacity	Total Standard	Total BCV	Total SRDF	Free Disk Space
000187461272	000187461272	No Symmetrix Agent	1000P-M2	9,068.90 GB	1,083.01 GB	19,251.79 GB	6,129.62 GB	1,139.72 GB	1,799.56 GB	1,799.56 GB

Figure 113 Properties view showing unconfigured storage

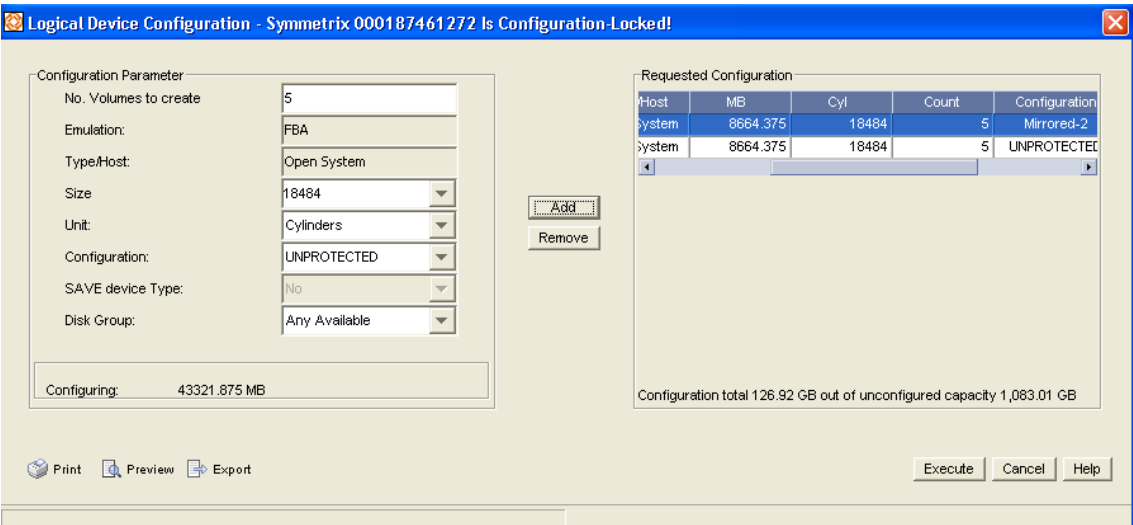
Configuring unconfigured storage

The database on the new Solaris host needs at least 40 GB (mirrored) of storage. Since the Symmetrix array uses 8.46 GB standards, the administrator needs to create five 8.46 GB drives, and five 8.46 GB unprotected devices that will be converted to BCVs.

To do this, the administrator:

1. In the Console tree, expands the folders **Storage Systems, Symmetrix**.
The Symmetrix arrays appear.
2. Right-clicks the Symmetrix array and selects **Device Configuration, Logical Device Configuration**.

The **Logical Device Configuration** dialog box appears ([Figure 114 on page 131](#)).



The screenshot shows the 'Logical Device Configuration - Symmetrix 000187461272 Is Configuration-Locked!' dialog box. It has two main sections: 'Configuration Parameter' on the left and 'Requested Configuration' on the right. The 'Configuration Parameter' section includes fields for 'No. Volumes to create' (5), 'Emulation' (FBA), 'Type/Host' (Open System), 'Size' (18484), 'Unit' (Cylinders), 'Configuration' (UNPROTECTED), 'SAVE device Type' (No), and 'Disk Group' (Any Available). There are 'Add' and 'Remove' buttons between the sections. The 'Requested Configuration' section is a table with columns: Host, MB, Cyl, Count, and Configuration. It shows two rows: 'system' with 8664.375 MB, 18484 Cyl, 5 Count, and 'Mirrored-2' Configuration; and 'system' with 8664.375 MB, 18484 Cyl, 5 Count, and 'UNPROTECTED' Configuration. At the bottom, it says 'Configuring: 43321.875 MB' and 'Configuration total 126.92 GB out of unconfigured capacity 1,083.01 GB'. There are 'Print', 'Preview', 'Export', 'Execute', 'Cancel', and 'Help' buttons at the bottom.

Host	MB	Cyl	Count	Configuration
system	8664.375	18484	5	Mirrored-2
system	8664.375	18484	5	UNPROTECTED

Figure 114 Logical Device Configuration dialog box

3. Creates five standard volumes and five unprotected volumes, each containing 18,484 cylinders (equivalent to 8.46 GB) as follows:

Adds five standard devices to the configuration as follows:

- a. In the No. Volumes to create field, enters **5**.
 - b. For the size, enters **18484** Cylinders (which is equivalent to 8.46 GB size).
 - c. For configuration, selects **Mirror-2** devices.
 - d. Clicks **Add** to add the configuration to the Requested Configuration table. At the bottom of the Requested Configuration table, the Configuration Total shows how much space will be used to create the configuration.
4. Adds five unprotected devices to the configuration (for use as BCVs) as follows:
 - a. In the No. Volumes to create field, enters **5**.
 - b. For the size, enters **18484** Cylinders (which is equivalent to 8.46 GB size).
 - c. For configuration, selects **UNPROTECTED**, which automatically disables **SAVE device type**.
 - d. Clicks **Add** to add the configuration to the Requested Configuration table. At the bottom of the Requested Configuration table, the Configuration Total shows how much space will be used to create the configuration.
 5. Clicks **Execute** to run the proposed configuration.

It takes several minutes to create the devices. When the execution steps have completed, the administrator is prompted to close the window.

6. In the Console tree, expands the Symmetrix array and expands the folders **Unmapped Devices, Standard Devices**.

The 10 devices that were just created appear at the bottom of the list.

7. Selects the devices and drags them into the Properties view to verify that there are five two-way mirrored and five unprotected devices.

[Figure 115 on page 133](#) shows the 10 devices: five two-way mirrored devices and five unprotected devices.

1 Properties - Symmetrix Devices						
Symmetrix	LUN Name	ID	Configuration	LUN Capacity	Allocated	Meta Size
	3FF6	3FF6	2-Way Mir	0.61 GB	Unallocated	N/A
	3FF7	3FF7	2-Way Mir	0.61 GB	Unallocated	N/A
	4000	4000	2-Way Mir	5.62 MB	Unallocated	N/A
	4001	4001	2-Way Mir	5.62 MB	Unallocated	N/A
	4002	4002	2-Way Mir	5.62 MB	Unallocated	N/A
	4003	4003	2-Way Mir	5.62 MB	Unallocated	N/A
	4004	4004	2-Way Mir	5.62 MB	Unallocated	N/A
	4005	4005	2-Way Mir	5.62 MB	Unallocated	N/A
	4006	4006	2-Way Mir	5.62 MB	Unallocated	N/A
	4007	4007	2-Way Mir	5.62 MB	Unallocated	N/A
	403C	403C	Unprotected	0.94 MB	Unallocated	N/A
	403D	403D	Unprotected	0.94 MB	Unallocated	N/A
	403E	403E	Unprotected	0.94 MB	Unallocated	N/A
	403F	403F	Unprotected	0.94 MB	Unallocated	N/A
	4040	4040	Unprotected	0.94 MB	Unallocated	N/A
	4041	4041	Unprotected	0.94 MB	Unallocated	N/A
	4042	4042	Unprotected	0.94 MB	Unallocated	N/A
	4043	4043	Unprotected	0.94 MB	Unallocated	N/A
	4044	4044	Unprotected	0.94 MB	Unallocated	N/A
	4045	4045	Unprotected	0.94 MB	Unallocated	N/A

Figure 115 Symmetrix devices

Creating BCVs

The administrator now creates BCVs from the unprotected devices they just created.

To do this, the administrator:

1. Selects the five unprotected devices from the Properties view.
2. Right-clicks the selected device and selects **Device Configuration, Device Type Definition**.

The **Device Type Definition** dialog box appears (Figure 116).

3. Selects the devices and clicks the **BCV** button.

Each devices' type changes to BCV and is highlighted in blue (Figure 116).

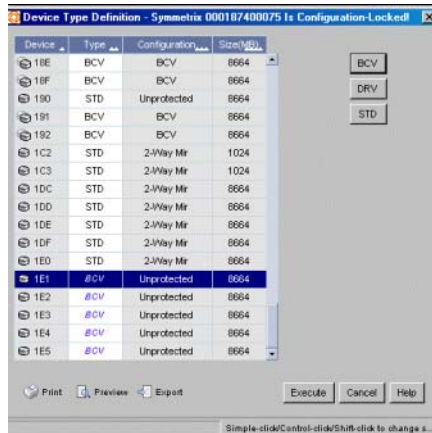


Figure 116 Define BCVs

4. Clicks **Execute** to start the device type conversion.
5. Closes the window when the device type conversion is complete.
6. Uses the Properties view to ensure that the devices were changed to BCVs.

Now that the BCVs have been created, the administrator can map the new standard devices to the FA port.

Configuring the connection

The administrator configures the connection to the Symmetrix storage array by:

- ◆ Mapping devices to the FA port.
- ◆ Adding the host and Symmetrix ports to a new Cisco VSAN.
- ◆ Zoning the Symmetrix to the host.
- ◆ Masking the devices.

Mapping devices to a FA port

In previous sections, the administrator found an available port (FA-3D Port 0) on the Symmetrix array and confirmed that it is suitable for this configuration. Now, the administrator uses Symmetrix Device Reallocation (SDR) to map the new standard and BCV devices to the FA port.

Gatekeeper devices may also need to be added to the host depending on what kind of information needs to be collected from the Symmetrix array.

To do this, the administrator:

1. In the Console tree, right-clicks the Symmetrix array (**000187400075**) and selects **Device Mapping > SDR Device Mapping**.

Ionix ControlCenter acquires a lock on the Symmetrix array and the **SDR Device Mapping** dialog box appears ([Figure 117](#)).

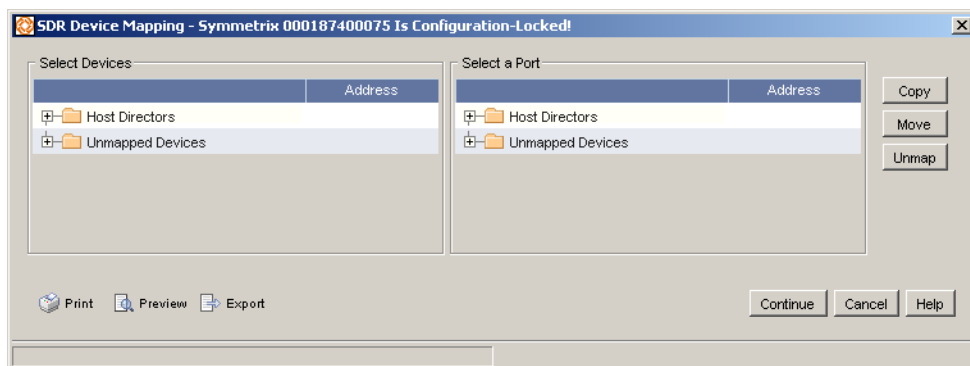


Figure 117 SDR Device Mapping dialog box

2. Under **Select Devices**, expands **Unmapped Devices**, and selects the standard devices (created in the previous sections) and gatekeeper devices (if required) to map to the FA port.
3. Under **Select a Port**, expands **Host Directors** and selects the director and port: **FA-3D Port 0**.
4. Selects **Port 0**, to highlight it, and clicks **Copy**.

The devices move from the left panel to the right panel under the selected port.

5. Repeats this procedure to add the new BCVs. The administrator selects **FA-3C Port 0**.
6. Clicks **Continue** to commit the changes.

The dialog box displays the proposed changes.

7. Clicks **Execute** to perform the changes.

The screen is updated as the changes are made.

When the execution steps have completed, the administrator is prompted to close the window.

Configuring the new interoperability VSAN

The administrator needs to create a virtual SAN (VSAN) in the physical fabric Mainstreet_3800. Mainstreet_3800 is a Cisco fabric consisting of two Cisco MDS switches: Cisco9216i (the master switch) and Cisco9216A. Solaris host l82ar156 and the port on Symmetrix 000187400075 to which the new devices are mapped are members of the physical Mainstreet_3800 fabric. Host l82ar156 is connected to switch Cisco9216i and Symmetrix port FA-3D Port 0 is connected to switch Cisco9216A. These two switches are physically connected to each other through an interswitch link.

Creating a VSAN involves the following tasks:

- ◆ Configuring the switch ports connected to Host l82ar156 and to storage port FA-3D Port 0 in the same Cisco VSAN, which is necessary because the VSAN acts as an independent fabric with its own exclusive zoning structure.
- ◆ Adding the host and storage ports to the same zone, adding the zone to a zone set, and then activating the zone set on the VSAN. See [“Zoning the host and storage ports” on page 141](#).

To create a VSAN, the administrator:

1. In the Console tree expands the folders **Connectivity, Fabrics, Mainstreet_3800 [Fabric]**.
2. Right-clicks the **VSAN** folder and selects **New**.

The **VSAN** wizard appears ([Figure 118](#)).

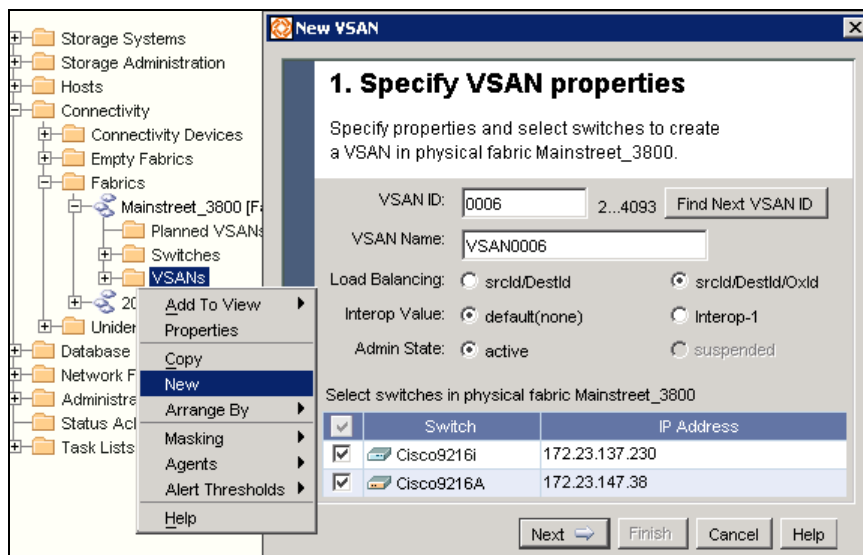


Figure 118 Step 1 of the VSAN wizard

3. In step 1 of the VSAN wizard, performs the following actions:
 - a. Enters the **VSAN ID** and **VSAN name**.
 - b. Selects the load balancing method, and switch membership.
 - c. For Interop Value, selects **Interop-1** to allow for the addition of interop-enabled Brocade or McDATA switch ports via the switch's management software at a later time.
 - d. Checks switches **Cisco9216i** and **Cisco9216A** in the table.
 - e. Clicks **Next**.

Step 2 of the VSAN wizard appears ([Figure 119 on page 138](#)).

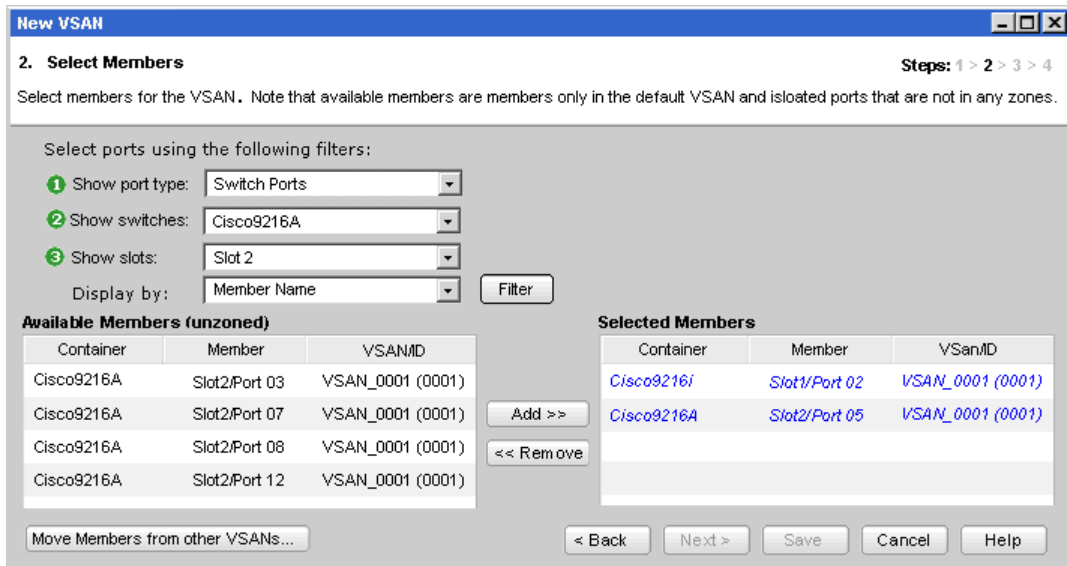


Figure 119 Step 2 of the VSAN wizard with switch Cisco9216A selected

4. In step 2 of the VSAN wizard, performs the following actions:
 - a. Selects the port type, the switch (Cisco9216i and Cisco9216A separately), and the slot to narrow the range of ports and displays in the Available Members table and clicks **Filter**.
 - b. For **Display by**, selects to display ports in the **Available Members** table by port **Member Name** or by port **WWN**.
 - c. In the **Available Members** table, selects:
 - Cisco switch port **Slot1/Port 02**, which is connected to host l82ar156.
 - Cisco switch port **Slot2/Port 05**, which is connected to Symmetrix port FA-3D Port 0.
 - d. Clicks **Add** to move both ports to the Selected Members table.

Note: The administrator could optionally click **Move Members from Other VSANs** to remove selected members out of other VSANs and into the VSAN wizard's Select Members table ([Figure 120 on page 139](#)).

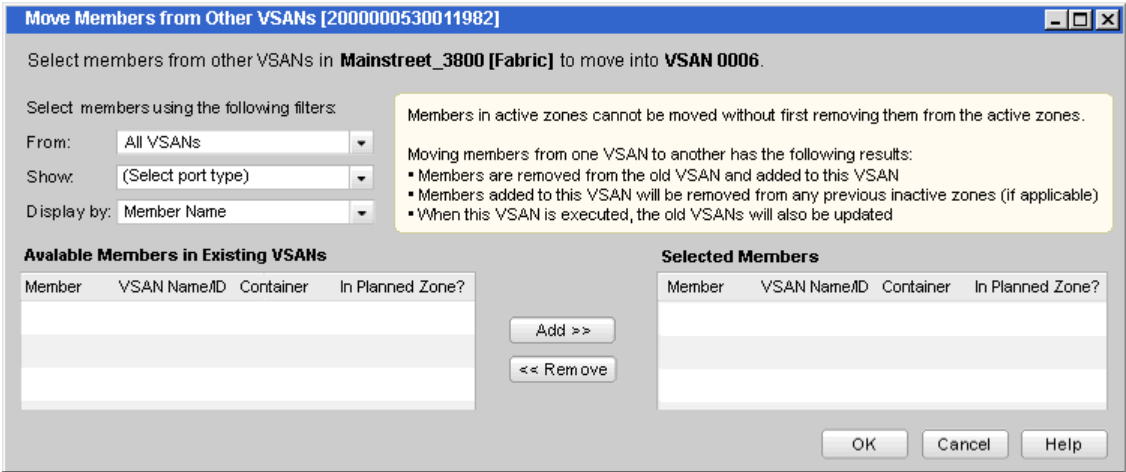


Figure 120 Move Members From Other VSANs dialog box

5. Clicks **Next**.
- Step 3 of the VSAN wizard appears (Figure 121).
6. Clicks **Review Properties** to review the properties of the VSAN.
7. Clicks **Review Members** to review the members of the VSAN.

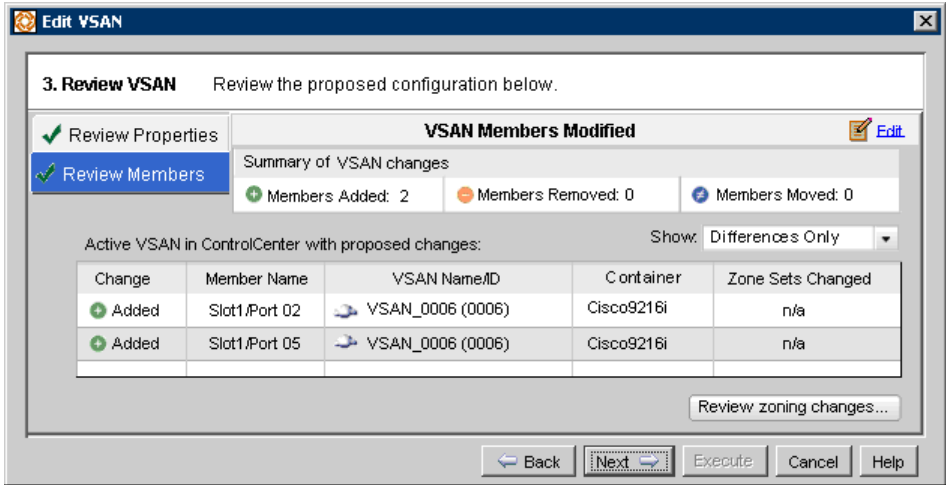


Figure 121 Step 3 of the VSAN wizard

Note: The administrator can click **Review Zoning Changes** to view the zoning changes that would have occurred had ports been moved from other VSANs (Figure 122 on page 140).

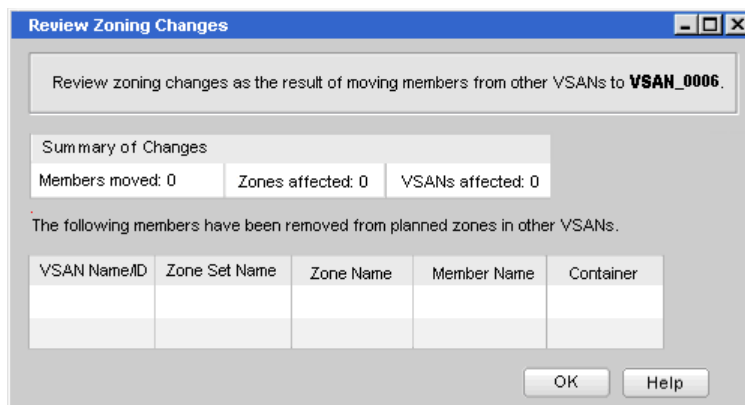


Figure 122 Review Zoning Changes dialog box

8. Clicks **Next**.

Step 4 of the VSAN wizard appears.

9. Selects one of the following options:

- **Distribute and commit VSAN now and copy running config to startup config.** Then selects **Cancel operation** or **Continue and overwrite**. The VSAN edits will appear both in Ionix ControlCenter and on the fabric.
- **Save changes to the planned VSAN folder in the physical fabric.** After the task succeeds on the Ionix ControlCenter Server, the new VSAN appears in Ionix ControlCenter in the fabric's Planned VSANs folder, but does not appear on the fabric.

10. Clicks **Execute**.

11. On the **Execute** dialog box, selects task list options to send the task list to the Ionix ControlCenter Server for execution.

12. Clicks **OK**.

The new VSAN0006 appears in the in the Ionix ControlCenter tree in the Planned VSANs folder under Connectivity, Fabrics, Mainstreet_3800 [Fabric].

Zoning the host and storage ports

Now that Host l82ar156 and Symmetrix port FA-3D Port 0 are configured in the same virtual fabric (VSAN 0006), the administrator can zone them together in an active zone set, so that I/O between the host and array can occur.

Creating a Zone and Adding Member Ports

To create a new zone and populate it with the required host and FA ports, the administrator:

1. In the Console tree, expands the folders **Connectivity**, **Fabrics**, **Mainstreet_3800 [Fabric]**, **Planned VSANs**, **VSAN0006**.
2. Right-clicks the **Planned Zones** folder and selects **New > Zone** (Figure 123 on page 141).

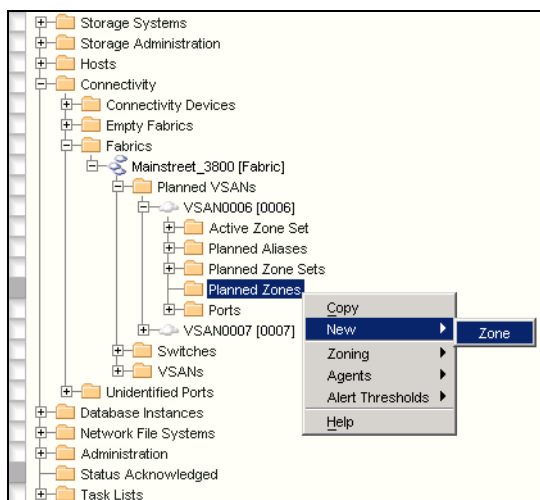


Figure 123 Opening the New Zone dialog box

3. In the **New Zone** dialog box, accepts the default zoning policy (None), or selects a zoning policy from the **Zoning Policy** menu (Figure 124 on page 142).

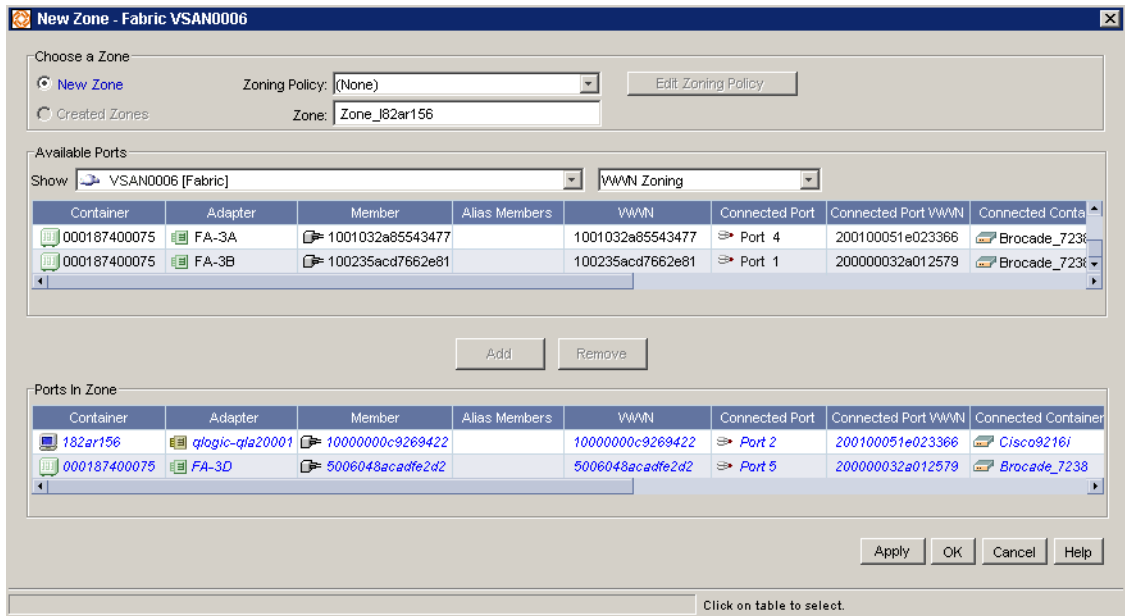


Figure 124 New Zone dialog box

Note: Zoning policies specify certain characteristics of new zones, and help to ensure that these characteristics are the same across all zones created in a fabric or a work group. Once a zone is created, however, the policy that was applied during zone creation or editing no longer has any effect on the zone.

4. For **Zone**, enters **Zone_l82ar156** for the name of the new zone.
5. In the **Available Ports** table, selects host **l82ar156** and storage port **FA-3D, Port 0, (Member 5006048acadfe2d2)**.
6. Clicks **Add** to move the host and storage port to the Ports in Zone table. Ports moved from one table to the other in the current session are displayed in blue italics.

Note: The administrator can use the two drop-down filter lists to manage the display of ports/aliases that appear in the Available Ports table. The first list filters by fabric; the second filters by port type or zoning type.

7. Clicks **OK** to save changes and closes the dialog box.

Note: New zone Zone_l82ar156 is now created with host l82ar156 and Symmetric port FA-3D, Port 0 as members. The new zone appears in the Console tree under Connectivity, Fabrics, Mainstreet_3800 [Fabric], Planned VSANs, VSAN0006, Planned Zones.

Adding a zone to a zone set and activating the zone set

Host l82ar156 and storage port FA-3D, Port 0 now exist in zone Zone_l82ar156. The administrator now adds the zone to a zone set and activates the zone set on virtual SAN VSAN0006. The administrator can add the zone to an existing zone set or create a new zone set.

In this example the administrator creates and activates new zone set Zone_Set_156.

To complete this task, the administrator:

1. In the Console tree, expands the folders **Connectivity, Fabrics, Mainstreet_3800 [Fabric], Planned VSANs, VSAN0006, Planned Zones**.
2. In the **Planned Zones** folder, right-clicks **Zone_l82ar156** and selects **Zoning, Add Zone to Zone Set** (Figure 125).

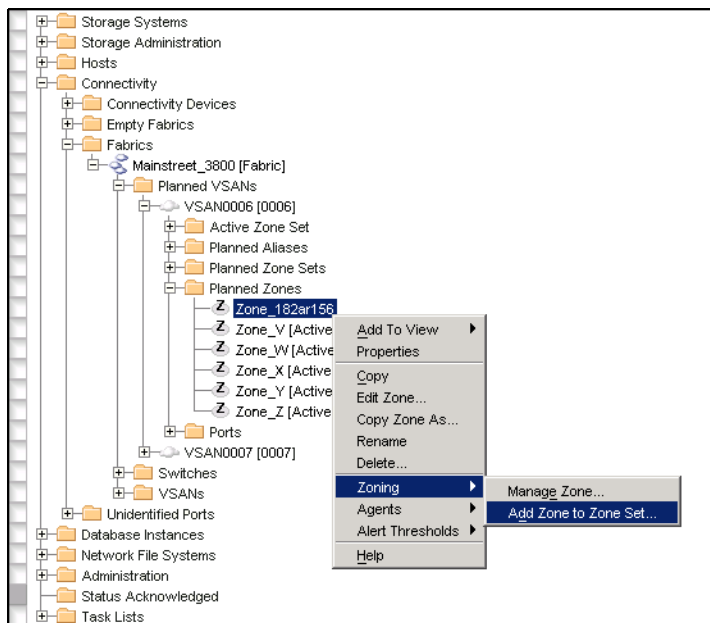


Figure 125 Adding a zone to a zone set

The **Add To Zone Set** dialog box appears with Zone_l82ar156 in the Zones In Zone Set table (Figure 125 and Figure 126).

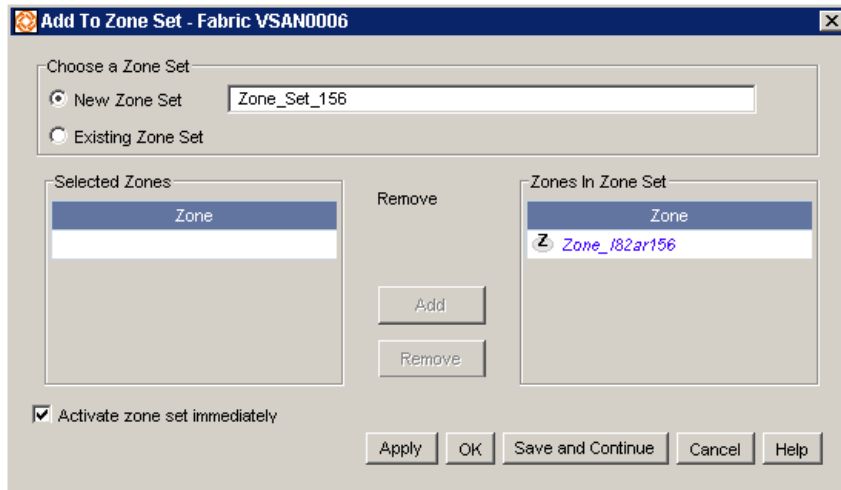


Figure 126 Add To Zone Set dialog box

3. In the **Add to Zone Set** dialog box, selects **New Zone Set** and enters **Zone_Set_156**.
4. Checks **Activate zone set immediately**.
5. Clicks **Save and Continue**.

The edits are saved, and the **Activate Zone Set** dialog box appears displaying the differences between the zone set about to be activated on the fabric and the zone set currently active in the Ionix ControlCenter Repository (Figure 127).

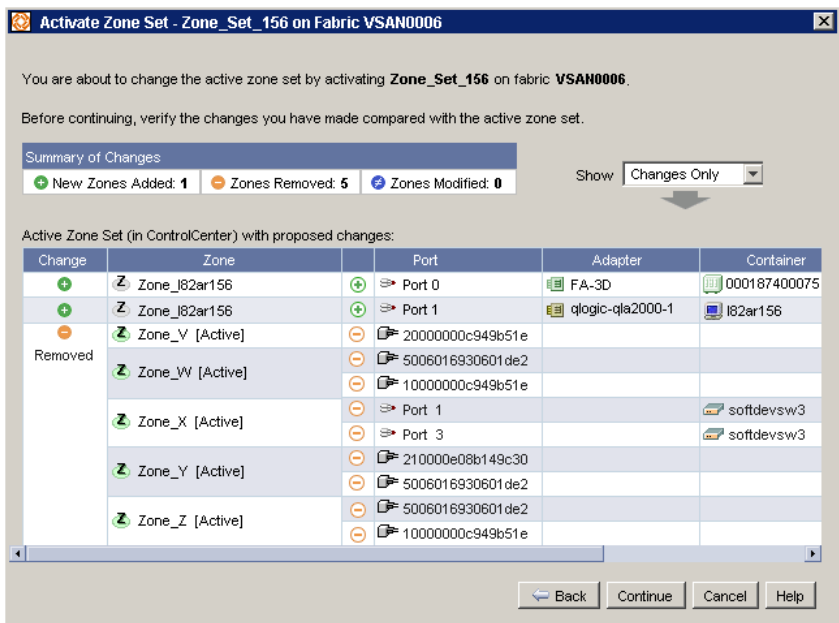


Figure 127 Viewing zone set differences before activating the zone set

6. Reviews the zone set differences and then clicks **Continue**.
7. In the confirmation dialog box that appears, selects one of the following options on the confirmation dialog box:
 - **Cancel operation** — Cancels the activate zone set operation if the active zone set on the fabric is out of sync with the active zone set in Ionix ControlCenter.
 - **Continue and overwrite** — Activates the new zone set even if the zone set active on the fabric is different from the Ionix ControlCenter active zone set. The new zone set overwrites the zone set that is currently active on the fabric without saving a copy.
8. Clicks **Execute**.



When Ionix ControlCenter activates a zone set, it overwrites the active zone set on the fabric. If the active zone set on the fabric has been changed using a third-party tool, it may be out of sync with the active zone set in Ionix ControlCenter. Ionix

ControlCenter does not save copies of zoning configurations that it overwrites on the fabric. To avoid loss of data, make copies of the fabric's active zone set with a third-party tool before using Ionix ControlCenter to activate a zone set.

Whether the operation succeeds or fails, the administrator can view the zone set differences in the Ionix ControlCenter task list. The following changes occur in the zoning folders in the Ionix ControlCenter tree (Figure 128 on page 146):

- A copy of the activated zone set replaces the zone set in the Active Zone Set folder.
- A copy of the activated zone set replaces the Copy of Active zone set in the Planned Zone Sets folder.
- A copy of the previous active zone set replaces the Last Active zone set in the Planned Zone Sets folder.

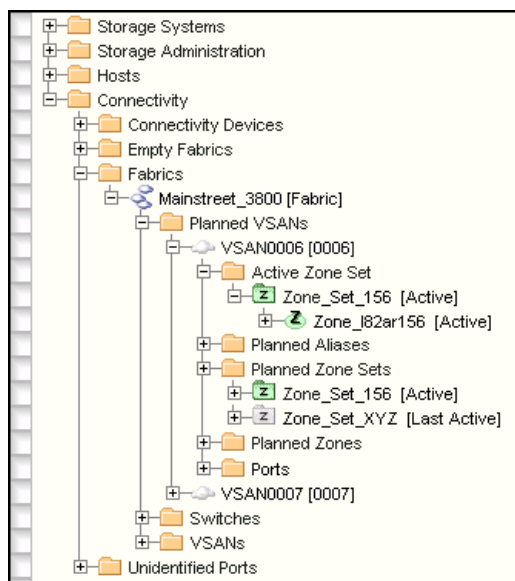


Figure 128 New tree configuration after activating *Zone_Set_156* on fabric *VSAN 0006*

Masking devices

Now that host l82ar156 and Symmetrix port FA-3D, Port 0 are actively zoned together, the administrator now uses the Ionix ControlCenter masking utility to configure secure host access to the Symmetrix array. The administrator grants host access to several storage devices mapped to port FA-3D Port 0.

The administrator already enabled masking on the Symmetrix array by setting the volume configuration management (VCM) port flag (see [“Verifying port settings” on page 126](#)). While masking remained disabled on the array, all hosts that were physically connected to storage ports on the array could access all the storage devices mapped to them.

Granting host access

To grant host access to the Symmetrix storage array, the administrator:

1. Clicks the **Storage Allocation** pull-down arrow in the Console taskbar, and selects **Masking** to display the Masking view.
2. In the Console tree, expands **Hosts**, **l82ar156**, **Adapters**, **qllogic-qla2000-1** and checks **Host Port 1** to add the port to Masking view ([Figure 129 on page 147](#)).

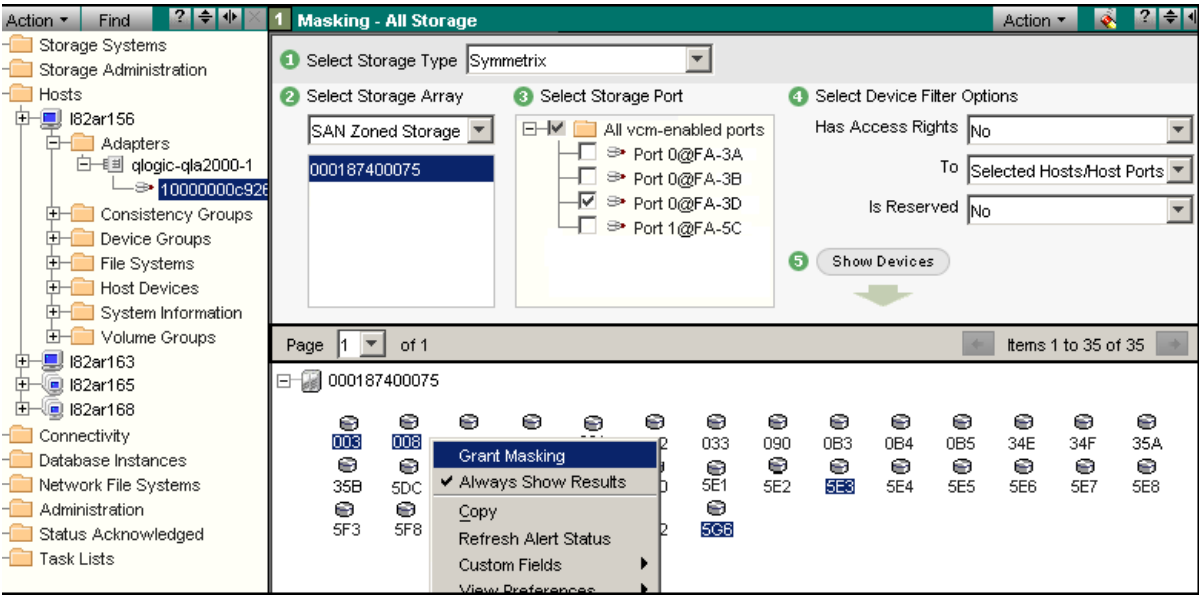


Figure 129 Symmetrix Masking view

3. In the Masking view, performs the following:
 - a. For **1-Select Storage Type**, selects **Symmetrix**.
 - b. For **2-Select Storage Array**, selects **SAN Zoned Storage**, and then selects array **000187400075** in the results window.

- c. For **3-Select Storage Port**, selects **Port 0@FA-3D**. You can select multiple storage ports, if necessary. Only VCM-enabled adapters and ports are displayed for Symmetrix arrays.
- d. For **4-Select Device Filter Options**, applies filters to the selection.
- e. Clicks **5-Show Devices** and displays storage devices that meet the filter criteria in the Masking view display area.

Note: The administrator can drag an LDEV from Masking view into Path Details view to quickly identify all the hosts that have access to it.

- 4. Right-clicks one or more logical devices and selects **Grant Masking**.
- 5. The **Modify Masking Configurations-Preview Changes** dialog box appears (Figure 130 on page 148).

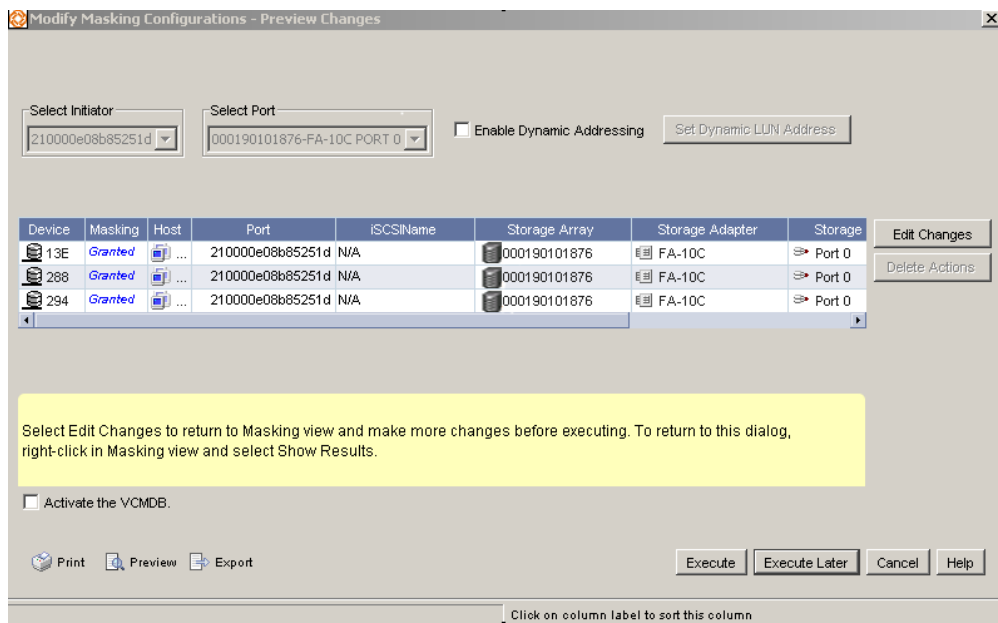


Figure 130 Modify Masking Configuration dialog box

Note: Optionally, the administrator could click **Edit Changes** to close the dialog box and return to the Masking view and make further modifications, or delete a masking operation(s) by selecting it in the table and clicking **Delete Actions**.

6. Previews the grant masking actions.
7. Checks **Activate the VCMDB** to automatically refresh the grant access actions to all the Fibre Channel adapters on the Symmetrix array.

If the administrator does not check **Activate the VCMDB**, the administrator must manually run the Make Active command in Ionix ControlCenter after the grant access tasks have finished running on the Ionix ControlCenter Server.

8. Clicks **Execute**.

After the operation executes on the Ionix ControlCenter Server, host l82ar156 has secure access to the selected devices on Symmetrix 30471 port FA-3D, Port 0. The modifications are visible to all the hosts that are connected to the Symmetrix storage array. If the change is not reflected in the Console, the administrator can reboot the host and run the host agent to rediscover the HBA.

Creating device groups

The administrator creates a device group containing the standards and BCVs to simplify the process of establishing devices. Placing both standards and BCVs in the same device group allows the administrator to establish all devices at once instead of individually.

To do this, the administrator:

1. In the Console tree, expands the folders **Storage Systems, Symmetrix**.
2. Expands the Symmetrix array (**000187400075**), the folder **Mapped Devices**, and then **Standard Devices**.
3. Selects the standard devices for the host: **1F4** through **1F8**.
4. Right-clicks the highlighted devices and selects **Data Protection, Device Groups, Create**.

Step 1 of the **Device Group Wizard** appears ([Figure 131](#)).



Figure 131 Device Group Wizard

5. For **Device group type**, selects **Regular**, and then clicks **Next**.

Step 2 of the **Device Group Wizard** appears ([Figure 132](#)).

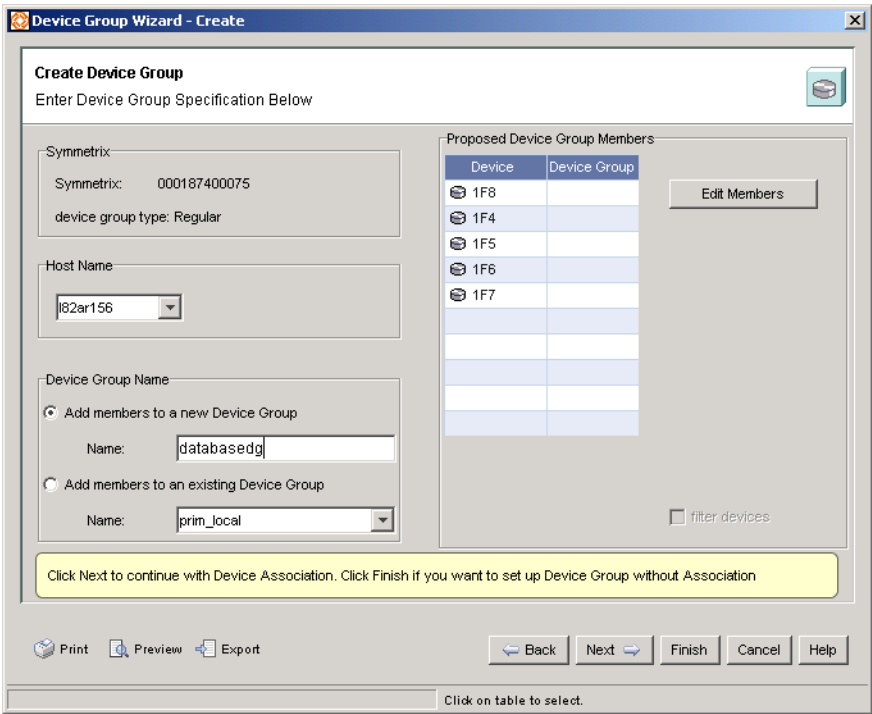


Figure 132 Creating a device group

6. Selects the host in which the device group will be created: **l82ar156**.
7. Under **Device Group Name**, clicks **Add Members to a New Device Group**.
8. Enters the name for the new device group: **databasedg**

If the administrator needs to add or remove members from the device group, they can click the **Edit Members** button.

9. Clicks **Next** when finished with the selections.

Step 3 of the **Device Group Wizard** appears (Figure 133).

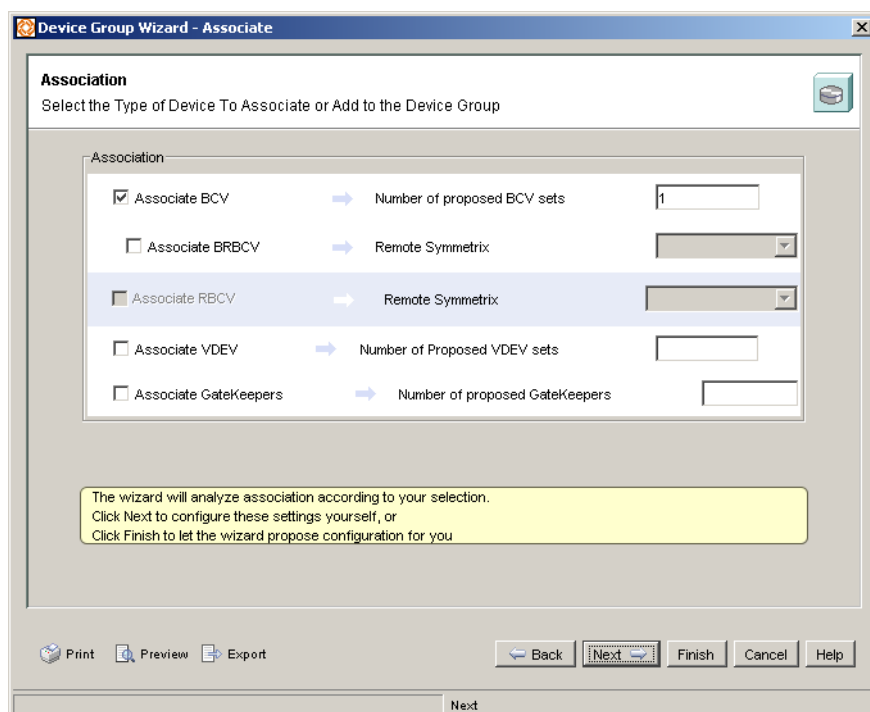


Figure 133 Associating devices to the device group

10. Selects the **Associate BCV** checkbox.
11. Enters the number of BCV sets and clicks **Next**.

The administrator enters **1**, for one copy of the database.

The wizard chooses the BCVs and enters them in the **Final Devices** column.

12. Removes the BCV devices selected in the wizard and replaces them with the BCV devices created earlier (**1F9** through **1FD**).

The administrator can make changes by highlighting a device and clicking **Add** or **Remove**.

13. Clicks **Next**.

The administrator is prompted to confirm the configuration before creating the device groups.

14. Clicks **Finish** to confirm the configuration.

A pop-up box confirms that the device group was created.

15. Clicks **Finish** to complete the task.

16. Verifies that the device group was created by expanding the host in the Console tree and then the folder **Device Groups**.

The device group appears (Figure 134).

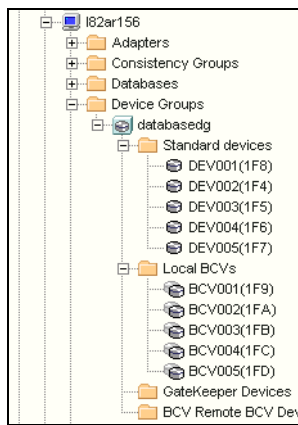


Figure 134 List of device groups

Establishing BCVs with standard devices

The administrator establishes the BCVs with the standards.

To do this, the administrator:

1. In the Console tree, expands the folder **Hosts**, host **l82ar156**, and the folder **Device Groups**.
2. Right-clicks device group **databasedg** and selects **Data Protection > TimeFinder > Establish**.

The **TimeFinder Establish** dialog box appears (Figure 135 on page 154).

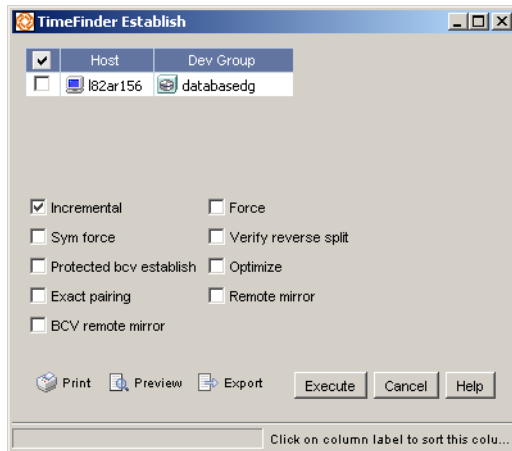


Figure 135 Establishing BCVs with standard devices

3. Clears the **Incremental** checkbox, and then clicks **Execute**.

The BCV will be established to the standard.

4. On the task bar, from the blue **Performance Management** button, selects **TimeFinder/SRDF QoS**, and displays the EMC TimeFinder®/EMC SRDF® QoS view.
5. Selects the device group to watch the progress of the establish in the view.

Once the device groups have established, the devices can be updated on the host system.

Discovering host devices

The administrator has completed storage allocation and now updates the disk information on the host after the configuration change.

To do this, the administrator:

1. In the Console tree, right-clicks host **l82ar156** and selects **Host, Rescan Disks**.

Note: Host agent must be installed in order to see the **Hosts, Rescan Disks** option.

A login dialog box appears the first time during the session when an attempt is made to perform a command that requires user authentication on this host.

2. Enters the **Username** and **Password** that provide the necessary privileges to complete the rescan task on this host.
3. Once the rescan completes, right-clicks host **l82ar156** and selects **Rediscover**.

The Discover data collection policy runs, and the host information in the Console is updated (Figure 136).

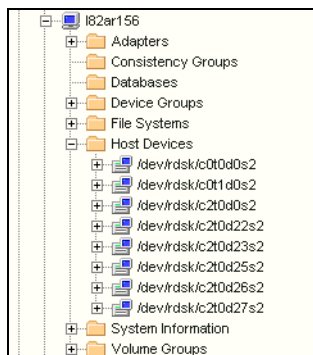


Figure 136 New devices are visible to the host

Allocating CLARiiON devices (LUNs) to a host

This example demonstrates allocating storage from a CLARiiON® CX600 array to an IBM AIX application server (l82ar156). The storage administrator is adding 10 GB of RAID 5 storage to the host.

The administrator completes the following tasks to allocate storage from the CLARiiON array:

- ◆ Ensures the CLARiiON storage is accessible from the host
- ◆ Finds the available storage
- ◆ Creates new LUNs if necessary
- ◆ Adds LUNs to an existing storage group (or creates a new one) so the host sees the LUNs

Determining if storage is available on the CLARiiON array

The administrator determines if there is available storage on the CLARiiON array through a StorageScope Array Summary report.

To do this, the administrator:

1. In the Console tree, expands the folders **Storage Systems, CLARiiON**.
2. Right-clicks the array (**WRE00022201023**) and selects **StorageScope Views**.
The StorageScope log in screen appears.
3. Enters the username and password.
4. From StorageScope console selects **Analysis > SRM Views > Arrays**.
5. Under **Consumption Details** tab selects **WRE00022201023**.
6. The Array Configuration report for this array is generated (Figure 137).

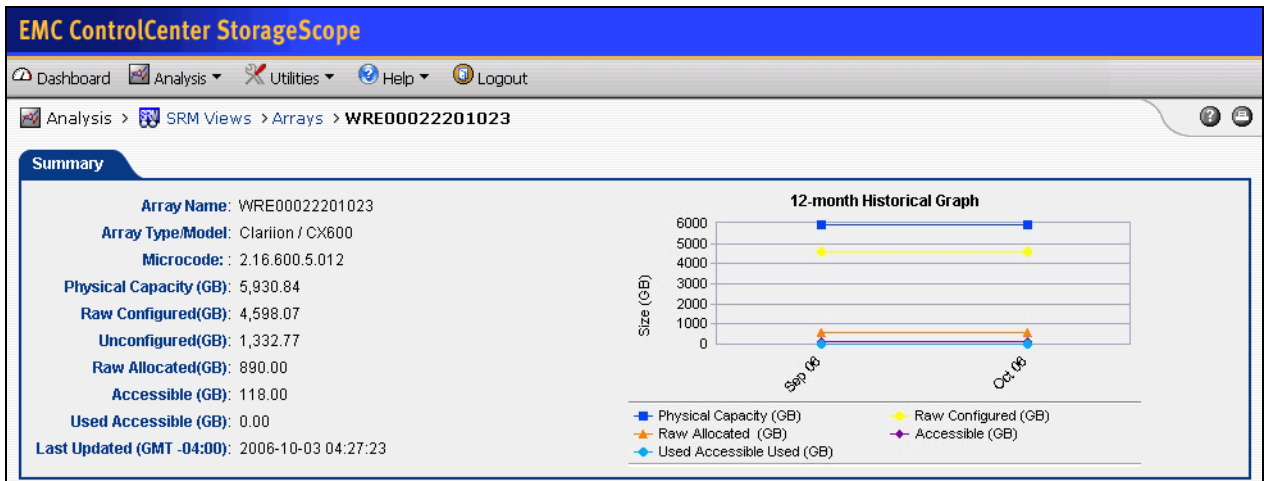


Figure 137 StorageScope array configuration report for the CLARiiON Array

The administrator determines that there is 1,332.77 GB of unconfigured space, 4,598.07 GB of raw configured space, and 890.00 GB of raw allocated space on this array.

Determining if type of connection is available

The administrator intends to add new storage to host l82ar136 and checks to ensure that the array is accessible.

To do this, the administrator:

1. On the Console toolbar, clicks the pull-down menu of the blue **Storage Allocation** button and selects **Path Details**.
2. In the Console tree, expands the folder **Hosts**, and then drags host l82ar136 into the target panel.
3. Selects the host to show devices. A table showing the path details by HBA for this host appears.
4. Clicks any HBA in the table.

The Path details for the host appear as shown in [Figure 138](#).

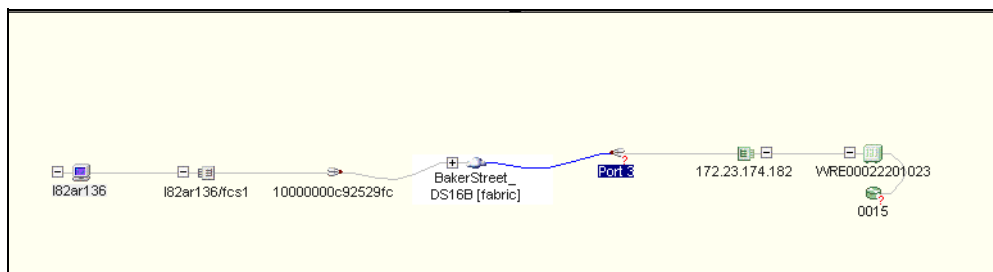


Figure 138 Path Details for host l82ar136

[Figure 138](#) shows that there is connectivity between the host and the CLARiiON array (WRE00022201023).

Because the path already exists, the administrator does not need to determine if ports are available, and can skip that portion of the workflow.

Determining if configured storage is available

The administrator determines if there is available configured storage on the CLARiiON array through the StorageScope Array Configuration report generated in [“Determining if storage is available on the CLARiiON array” on page 155](#). The StorageScope Array Summary report is shown in [Figure 139 on page 158](#).

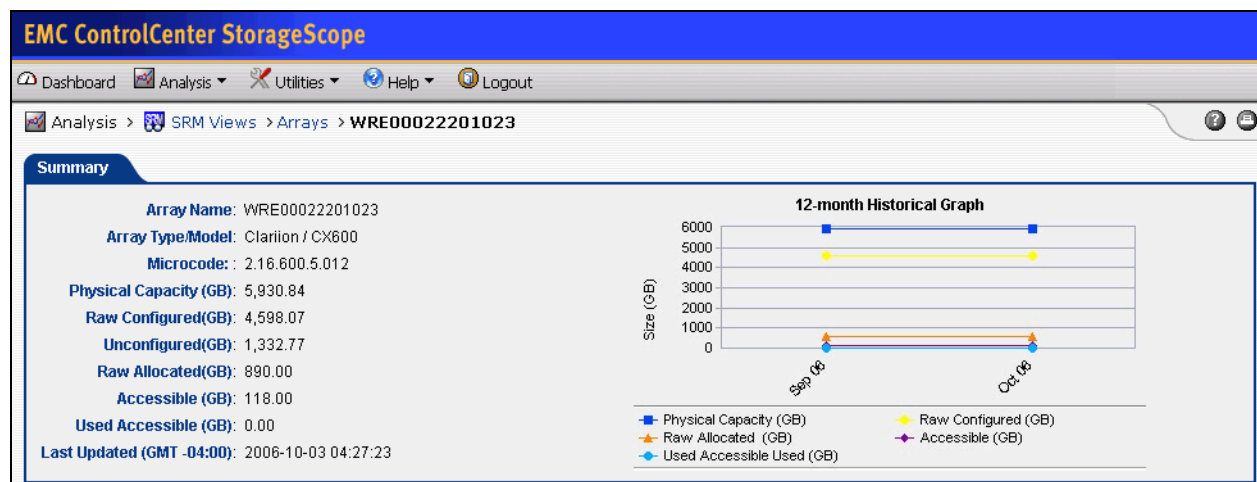


Figure 139 StorageScope report showing available configured storage

The administrator determines that there is over 150 GB of available configured unallocated storage.

The administrator also needs to ensure that the available storage is the correct protection type (RAID 5).

To do this, the administrator:

1. On the Console toolbar, clicks the **Properties** view button.
2. In the Console tree, expands the CLARiiON array.
3. Drags the unmapped LUNs into the Properties view.
4. Sorts on the Configuration column (by clicking the column heading).

This shows the RAID-level protection of the LUNs.

Configuring the connection

The administrator determined in the previous section that LUNs are available for allocation. If LUNs were not available for allocation, the administrator could create the LUNs using Ionix ControlCenter Navisphere Manager.

The administrator allocates the existing LUNs as follows:

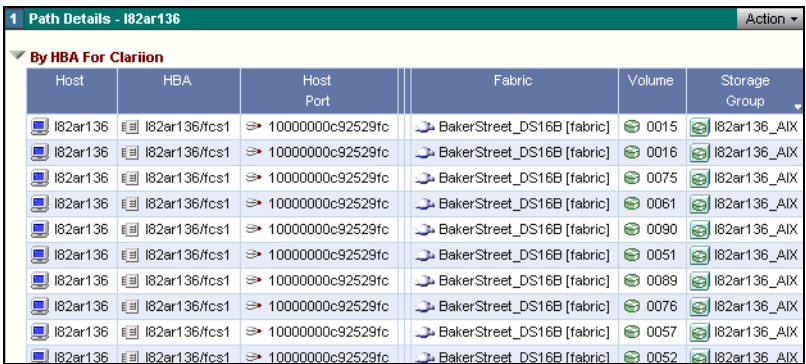
- ◆ Determines if a storage group exists

- ◆ Finds available LUNs
- ◆ Adds LUNs to the storage group

Determining if storage group exists

The LUNs will be placed in a storage group for the host. Only one storage group can exist per host. The administrator determines that a storage group already exists by selecting the host in the Console tree, and selecting Storage Allocation, Path Details in the toolbar. [Figure 140](#) shows that the existing storage group is named I82ar136_AIX.

If this host did not have a storage group, the administrator could have created a new one by right-clicking **Storage Groups** under the CLARiiON array in the Console tree and selecting New. This displays the Storage Group Configuration Wizard.



Host	HBA	Host Port	Fabric	Volume	Storage Group
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0015	I82ar136_AIX
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0016	I82ar136_AIX
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0075	I82ar136_AIX
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0061	I82ar136_AIX
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0090	I82ar136_AIX
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0051	I82ar136_AIX
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0089	I82ar136_AIX
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0076	I82ar136_AIX
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0057	I82ar136_AIX
I82ar136	I82ar136/fcs1	10000000c92529fc	BakerStreet_DS16B [fabric]	0052	I82ar136_AIX

Figure 140 Storage group

Finding available LUNs

The administrator finds the available (unmapped) LUNs on the array by right-clicking Unmapped LUNs under the CLARiiON array in the Console tree and selecting Properties.

Host I82ar136 requires 10 GB of RAID 5 storage. LUN 1 will meet host's needs as shown in [Figure 141](#).

1 Properties - CLARiiON LUNs							
	LUN Name	LUN ID	UID	Configuration	Replication Type	Drive Type	LUN Capacity
123	LUN 238	0238	60:06:01:61:2E:09:00:00:F3:FF:5B:71:C6:C9:D7:11	Hot Spare	N/A	Fibre Channel	66.61 GB
	LUN 239	0239	60:06:01:61:2E:09:00:00:F2:FF:5B:71:C6:C9:D7:11	Hot Spare	N/A	Fibre Channel	66.61 GB
	LUN 38	0038	60:06:01:60:B6:C6:09:00:DC:9B:B1:80:5E:51:DA:11	N/A	N/A	Fibre Channel	4.00 GB
	LUN 30	0030	60:06:01:61:2E:09:00:00:F0:FF:5B:71:C6:C9:D7:11	RAID1	N/A	Fibre Channel	10.00 GB
	LUN 31	0031	60:06:01:61:2E:09:00:00:F1:FF:5B:71:C6:C9:D7:11	RAID1	N/A	Fibre Channel	10.00 GB
	LUN 70	0070	60:06:01:F6:3F:09:00:00:75:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 71	0071	60:06:01:F6:3F:09:00:00:76:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 72	0072	60:06:01:F6:3F:09:00:00:77:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 73	0073	60:06:01:F6:3F:09:00:00:78:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 74	0074	60:06:01:F6:3F:09:00:00:79:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 75	0075	60:06:01:F6:3F:09:00:00:7A:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 76	0076	60:06:01:F6:3F:09:00:00:7B:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 77	0077	60:06:01:F6:3F:09:00:00:7C:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 78	0078	60:06:01:F6:3F:09:00:00:7D:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 79	0079	60:06:01:F6:3F:09:00:00:7E:23:21:FD:CE:00:D8:11	RAID1	N/A	Fibre Channel	1.00 GB
	LUN 1	0001	60:06:01:60:B6:C6:09:00:82:3D:90:E8:D1:84:DD:11	RAID5	N/A	Fibre Channel	266.42 GB

Figure 141 Available unmapped LUNs

The administrator adds the LUNs to storage group **l82ar136_AIX** through the Storage Group Configuration Wizard.

To do this, the administrator:

1. In the Console tree, expands the folders **Storage Systems, CLARiiON Arrays, WRE00022201023, Storage Groups**.
2. Right-clicks storage group **l82ar136_AIX** and selects **Edit**.

The Storage Group Configuration Wizard appears displaying the storage group the administrator intends to edit.

3. Clicks **Next**.

The **Add/Remove LUNs** screen appears (Figure 142 on page 161).

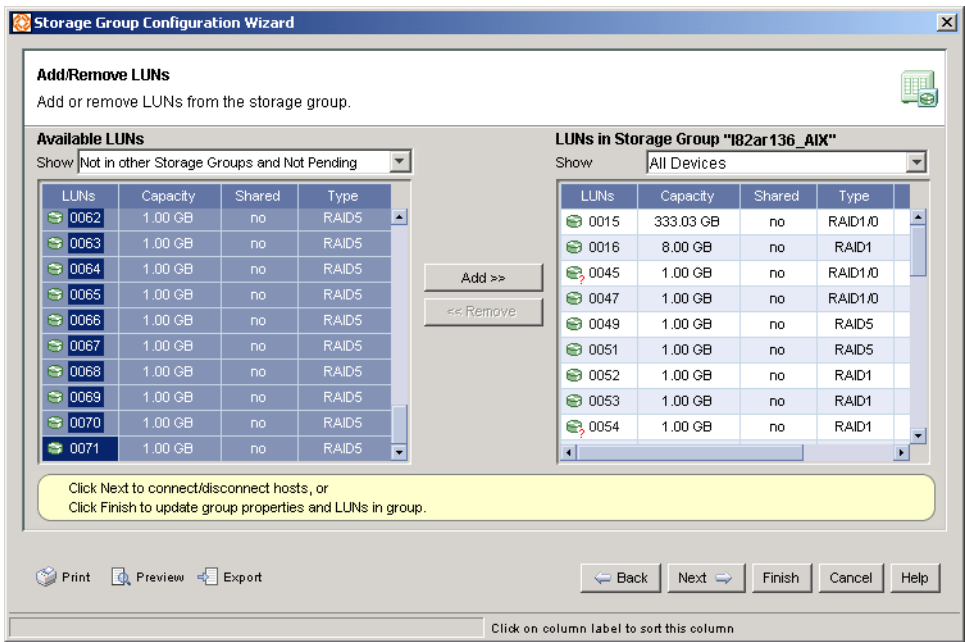


Figure 142 Adding LUNs to the storage group

4. Finds the appropriate LUNs on the left side of the wizard screen and clicks **Add** to add them to the Storage Group. The administrator adds LUNs **62** through **71**.
5. Clicks **Finish**. The proposed changes are displayed.
6. Reviews the proposed changes and clicks **Execute**.

A task list appears.

7. Fills in the task list name and task name to easily view the execution progress and status. The administrator names the task **I82ar136** (after the host).
8. Confirms that the LUNs were successfully placed in the storage group by clicking the **Properties** button on the toolbar, and then expanding the following in the Console tree: **Task Lists, SAN Tasklists, I82ar136**.

The table shows a status of Succeeded (Figure 143).

Task List	Task	Operation	Status	Start Date	End Date	Creation Date
I82ar136	Add LUNs to SG	CLARiiON Wizard	Succeeded	Tue Oct 03 11:53:22 EST 2006	Tue Oct 03 11:54:12 EST 2006	Tue Oct 03 11:53:20

Figure 143 Storage group configuration task succeeded

Discovering host devices

The administrator has completed storage allocation and now updates the disk information on the host after the configuration change.

To do this, the administrator:

1. In the Console tree, right-clicks host **l82ar136** and selects **Host, Rescan Disks**.

Note: Host agent must be installed in order to see the **Hosts, Rescan Disks** option.

A login dialog box appears the first time during the session that an attempt is made to perform a command that requires user authentication on this host.

2. Enters the **Username** and **Password** that provide the necessary privileges to complete the rescan task on this host.
3. Once the rescan completes, right-clicks host **l82ar136** and selects **Rediscover**.

The Discover data collection policy runs, and the host information in the Console is updated.

[Figure 144 on page 163](#) shows the new LUNs appearing in the Storage Group for l82ar136 in the Console tree. The server sees the devices after rediscovery is complete. The administrator has completed the allocation of LUNs to the application server.

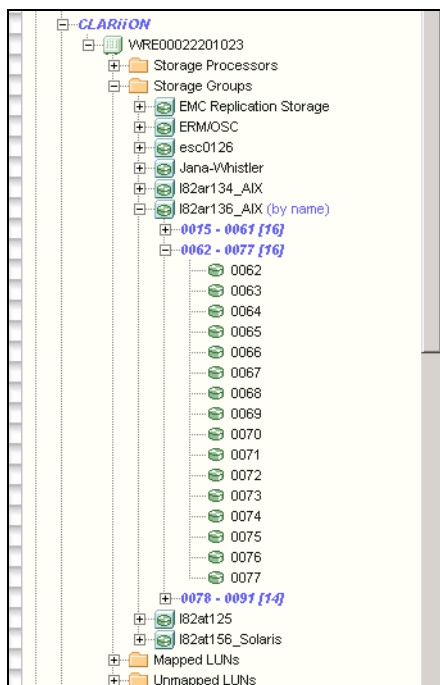


Figure 144 LUNs are now available to the application server

Adding devices to a CLARiiON metaLUN for a host

This example demonstrates how a storage administrator uses Ionix ControlCenter to add devices to (expand) a metaLUN on a CLARiiON CX600 array. MetaLUNs are groups of striped or concatenated LUNs that can be easily created or expanded using the Ionix ControlCenter Expand Storage Wizard. The administrator uses metaLUNs as a way of managing groups of devices based on the type and amount of storage required by various business applications.

In this scenario, the administrator has received a free space alert that a logical volume on an AIX host has reached a critical space threshold with only 5 percent capacity remaining.

Note: Refer to [“Preventing a space shortage on a host logical volume” on page 88](#) for details on how to configure and respond to free space alerts.

After acknowledging the alert, the administrator determines that all of the allocated RAID 5 storage (80 GB) for host l82ar134 is utilized and that an additional 80 GB of RAID 5 storage must be allocated.

The following steps are required to allocate additional storage to the host:

- ◆ Determine if Storage is Available
- ◆ Start the Expand Storage Wizard
- ◆ Select LUNs to add to metaLUN (or create metaLUN)
- ◆ Review and Execute the Expansion
- ◆ Confirm the Allocation

Determining if storage is available

The administrator determines the LUNs accessible to the host by navigating, from the Console tree, to hosts devices under the AIX host and dragging them into the Relationship view. [Figure 145](#) shows that host l82ar134 is connected to the CLARiiON CX600 array and an existing metaLUN named LUN 15 META. The administrator will add more storage to the host by adding LUNs to the existing metaLUN using the Expand Storage Wizard.

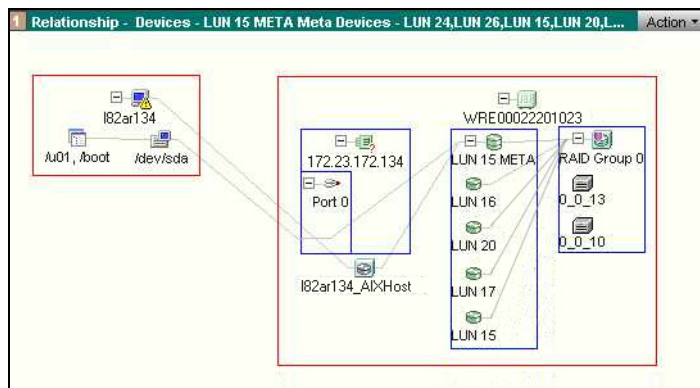


Figure 145 Relationship view

Starting the Expand Storage Wizard

The administrator starts the wizard as follows:

1. In the tree panel, expands the **Storage Systems** folder.

2. Expands the CLARiiON array containing the metaLUN for host l82ar134.
3. Expands the **Mapped LUNs** folder and displays the LUNs (and metaLUNs) on the array.
4. Right-clicks the metaLUN (**LUN 15 Meta**) and selects **Configure > Expand LUN/MetaLUN**.

The **Expand Storage Wizard** appears showing the current state of the metaLUN. In this case, the wizard shows that all of the 80 GB of RAID 5 storage is utilized (Figure 146).

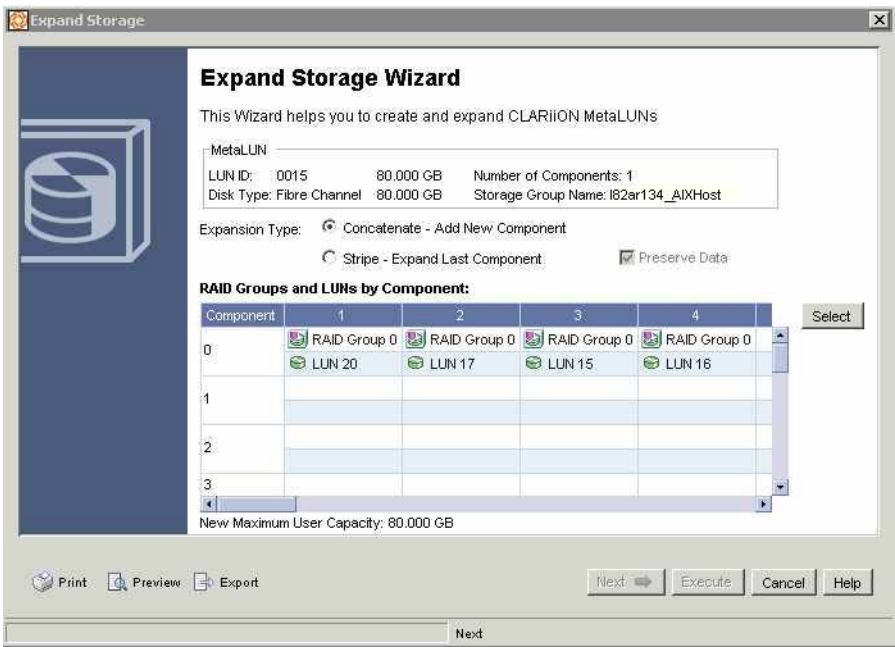


Figure 146 Expand Storage Wizard

5. Clicks **Next** to begin selecting the LUNs to add to the metaLUN.

Selecting the LUNs

The first Select LUNs screen displays all of the available LUNs. The administrator selects LUNs as follows:

1. Scrolls through the Available LUNs panel to find 80 GB of RAID 5 storage.

2. Selects the appropriate RAID group and clicks **Add** to add the RAID group to the right-hand panel. The new maximum capacity (160 GB) appears.

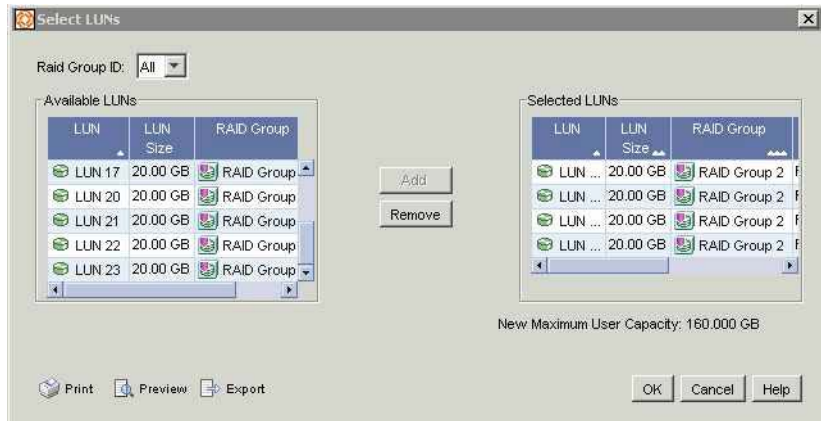


Figure 147 Selected RAID group showing new user capacity

3. Clicks **OK** after determining that enough storage is selected. The wizard displays the new metaLUN components and the new maximum capacity (Figure 148).

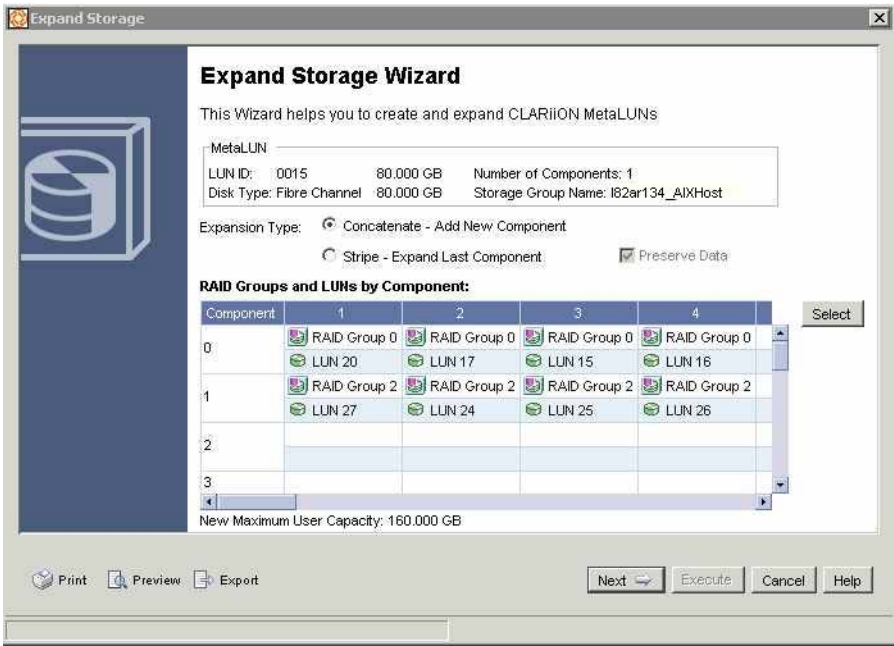


Figure 148 RAID groups and LUNs by component

Reviewing and executing the expansion

The administrator verifies the metaLUN properties as follows:

1. Clicks **Next** and verifies (the administrator makes no changes) the final metaLUN Properties information, and then clicks **Next** again to review the metaLUN configuration.

Figure 149 shows the new devices that will be added to the metaLUN.

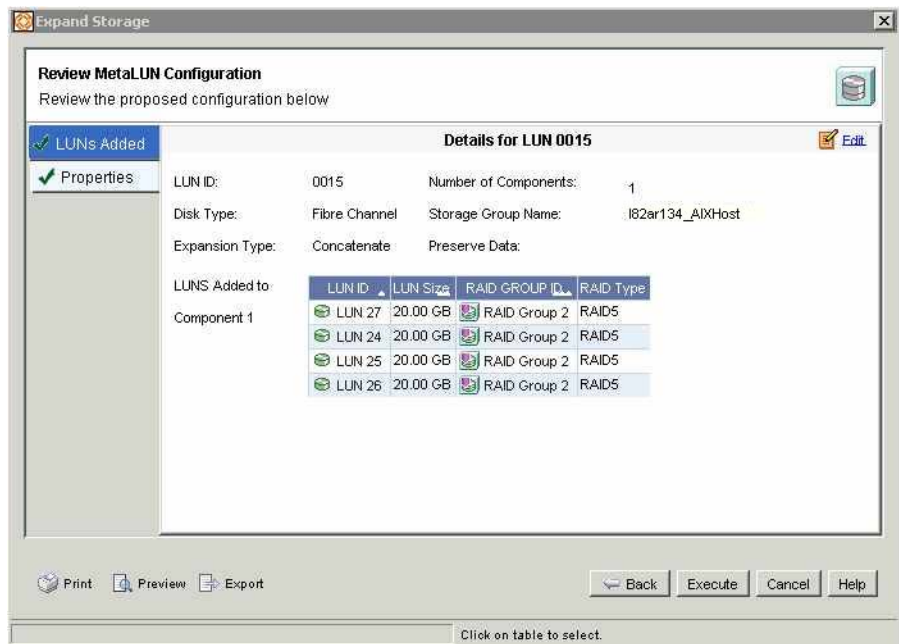


Figure 149 Review MetaLUN configuration

2. After reviewing the details for the metaLUN expansion, the administrator clicks **Execute** to complete the task.

Confirming the allocation

The administrator confirms the allocation of additional storage to the host by navigating, from the Console tree, to hosts devices under the AIX host and dragging them into the Relationship view (Figure 150). The new RAID group, containing LUNs 24, 25, 26, and 27, is now part of the expanded metaLUN and accessible to the host.

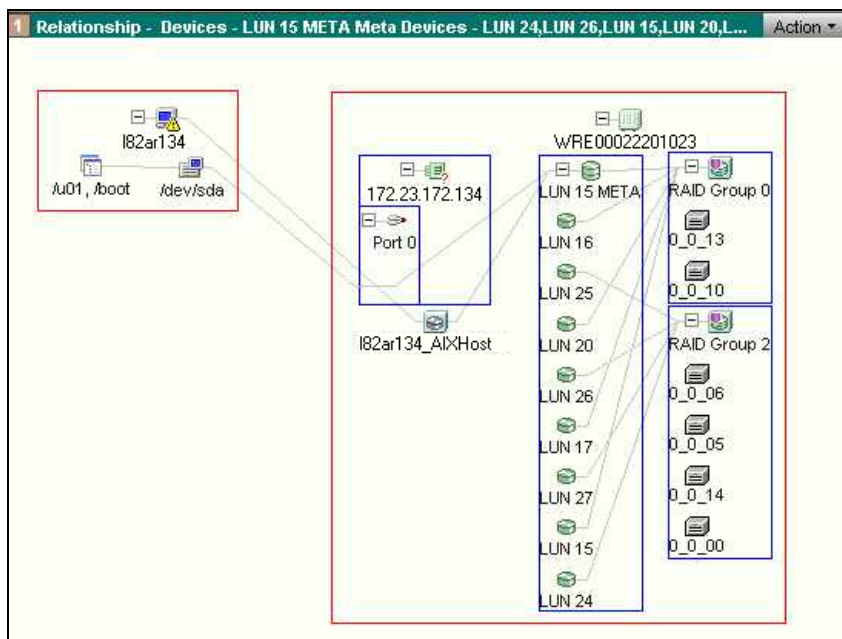


Figure 150 Relationship view showing new LUNs in metaLUN

Discovering host devices

The administrator has completed storage allocation and now updates the disk information on the host after the configuration change.

To do this, the administrator:

1. In the Console tree, right-clicks host **l82ar134** and selects **Host, Rescan Disks**.

Note: Host agent must be installed in order to see the **Hosts, Rescan Disks** option.

A login dialog box appears the first time during the session when an attempt is made to perform a command that requires user authentication on this host.

2. Enters the **Username** and **Password** that provide the necessary privileges to complete the rescan task on this host.
3. Once the rescan completes, right-clicks host **l82ar134** and selects **Rediscover**.

The Discover data collection policy runs, and the host information in the Console is updated.

Adding HP XP LUSEs to a host

This example demonstrates how a storage administrator uses Ionix ControlCenter to add a new website and requires an additional 20 GB of RAID 5 storage for the Web server. The Web server (l82ar122) is an existing host that is already cabled and zoned to an HP XP 12000 array.

During the initial setup and configuration of the HP XP array and this host, the administrator used Ionix ControlCenter to complete the following tasks:

- ◆ Enabled LUN security on the array port (otherwise, all LUNs mapped to this port will be accessible to the connected host.)
- ◆ Set the host mode on the array ports to specify which hosts (based on OS) can access the LUNs on the array.
- ◆ Zoned the host and array ports.
- ◆ Added the host to a host group on the storage port.

Once the array ports are set up correctly, the administrator adds storage to the Web Server as follows:

- ◆ Determines the array port
- ◆ Determines if storage is available
- ◆ Creates LUSEs (logical unit size expansion volumes)
- ◆ Masks devices to the array port
- ◆ Discovers devices on host

Determining the array port

The administrator uses the Relationship view to determine which port on the array has connectivity to the host.

To do this, the administrator:

1. On the Console toolbar, clicks the **Relationship** button and displays the Relationship view.
2. Clicks the **Table** button to switch from the map view to the table view.
3. In the Console tree expands the folders **Hosts**, **Windows Hosts**, **host l82ar122**, **Host Devices**, and drags host l82ar122 into the Relationship view ([Figure 151](#)).

The Relationship view shows that host l82ar122 is connected to the HP XP array 30471 through Director CHA-2X, port CL2-K.

Relationship - Relationships							Action	Filter
ce	Director	Port	Group	Target/LUN	Device	Meta Membe		
E37	CHA-2X	CL2-K		(5)	3:08	3:0C		
				(5)	3:08	3:29		
E38	CHA-2X	CL2-K			0:04			
E39	CHA-2X	CL2-K		(6)	0:4C			
E40	CHA-2X	CL2-K		(7)	0:05			
E41	CHA-2X	CL2-K		(8)	0:28			

Figure 151 Use Relationship view to see host to array port connectivity

Determining if storage is available on the HP XP array

The administrator uses the Properties view to see if there is any available storage.

To do this, the administrator:

- 1. On the Console toolbar, clicks the **Properties** button and displays the **Properties** view.
- 2. In the Console tree, expands the folders **Storage Systems**, **HP XP Arrays** (if not already expanded).
- 3. Drags the HP XP array and the Unmapped Devices folder into the target panel.

The array **Properties** view appear (Figure 152).

Properties				
HP XP and HDS Arrays				
Array	S/N	Vendor	Name	Cache Size
30471	30471	HP	XP 512@172.23.150.36	0.00
0.00				
HP XP and HDS LUNs				
Storage Array	LUN	LUN Name	Emulation	LUN Capacity
30471	01:FC	01:FC	OPEN-E	13.57 GB
	03:04	03:04	OPEN-E	2.29 GB
	03:11	03:11	OPEN-E	2.29 GB
	03:32	03:32	OPEN-E	2.29 GB
30471	03:35	03:35	OPEN-E	2.29 GB
	03:35	03:35	OPEN-E	2.29 GB

Properties				
HP XP and HDS Arrays				
Array	S/N	Vendor	Name	Cache Size
30471	30471	HP	XP 512@172.23.150.36	0.00
0.00				
HP XP and HDS LUNs				
Array	Expansion Status	Reserved	Is CMD Device	RAID Level
0	Not expanded	No	No	RAID5(3D+1P)
0	Not expanded	No	No	RAID5(3D+1P)
0	Not expanded	No	No	RAID5(3D+1P)
0	Not expanded	No	No	RAID5(3D+1P)
0	Not expanded	No	No	RAID5(3D+1P)

Properties				
HP XP and HDS Arrays				
Array	S/N	Vendor	Name	Cache Size
30471	30471	HP	XP 512@172.23.150.36	0.00
0.00				
HP XP and HDS LUNs				
Array	Status	Is Allocated	CU	Top LDEV
0	N/A		1	N/A
0	N/A		1	N/A
0	N/A		1	N/A
0	N/A		2	N/A

Figure 152 Use Properties view to determine if there is enough unallocated capacity

The administrator uses the **LUN Capacity** and **RAID Level** columns from the Properties view to determine that there is enough unallocated capacity of the appropriate size and RAID level for allocation to the Web server.

Creating LUSEs

Logical unit size expansion (LUSE) volumes combine two or more HP XP devices (LDEVs) to function as one large device, much like a metadvice on a Symmetrix array. The LUSE appears as a single large device instead of several smaller ones to the host.

The Properties view showed that there were enough unmapped 2.29 GB devices with RAID 5 protection available to provide the 20 GB of new storage for the host. The devices are located on control units (CU) 1 and 2.

Because these devices are not all on the same control unit (CU), the administrator creates two LUSEs (a LUSE cannot contain devices with different CUs).

The administrator creates the LUSEs as follows:

1. In the Console tree, expands the folders **Storage Systems**, **HP XP Arrays** (if not already expanded).
2. Right-clicks the StorageWorks XP array (**30471**), and selects **Configure > Create LUSE**.

3. The **New LUSEs** dialog box appears (Figure 153 on page 173).

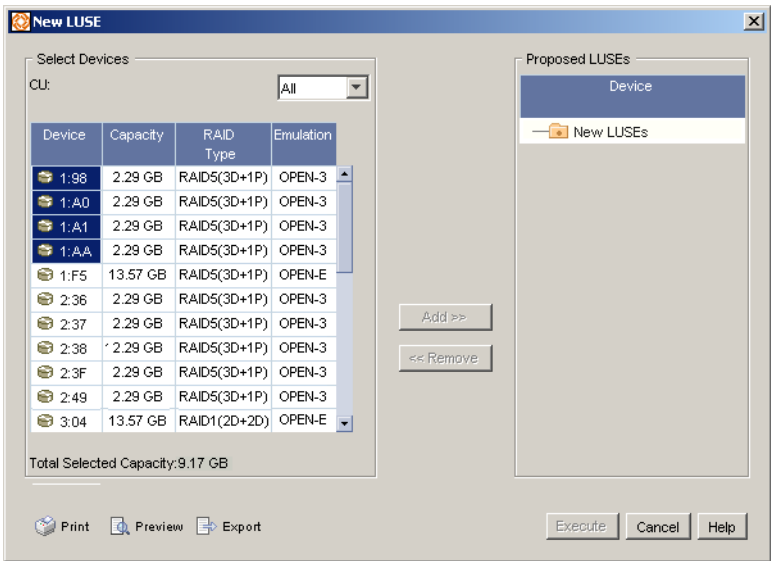


Figure 153 Create the LUSEs

4. Under **Select Devices**, selects either **All** to view all of the devices and their CUs or selects the specific Control Unit (**1**) to view the devices it owns. The devices appear in the table under the menu.
5. In the devices table, holds the **Ctrl** key down and selects the devices to add to the LUSE volume. The lowest number ID number will become the meta head (top device) of the LUSE volume (**1:98** in this case).
6. Checks **Select Lun Address Automatically** to have the next available LUN ID applied to the LUSE volume when it is mapped.
7. Clicks **Create** to establish the LUSE volume.
8. Selects Control Unit **2** from the menu and repeats steps 5 through 7.
9. Clicks **Continue** and displays the preview panel.
10. Reviews the details of the proposed LUSE volumes, and then clicks **Execute** to create them.

The two LUSEs consisting of nine 2.29 GB RAID 5 devices are now mapped to the correct array port and ready to be masked to the host. The LUSEs are identified by the lowest numbered device in each LUSE. In this case, the LUSEs are **1:98** and **2:36**.

Granting host access to the LUSEs (Masking)

The administrator now grants host l82ar122 access to LUSEs 1:98 and 2:36, which are mapped to port CL2-K@CHA-2X on array 30471. Host access is granted to HP XP 12000 storage arrays exclusively through user-defined host groups that reside on the storage port.

Adding a host to a host group

To add host l82ar122 to a host group, the administrator:

1. In the Console tree, expands **Storage Systems, HP XP Arrays, HP XP Array 30471, Controller CHA-2X, Storage Port, Host Groups**.
2. Right-clicks host group **HostGrpX** and selects **Masking, Host Group, Edit**.

The **Edit Host Group** dialog box appears ([Figure 154 on page 175](#)).

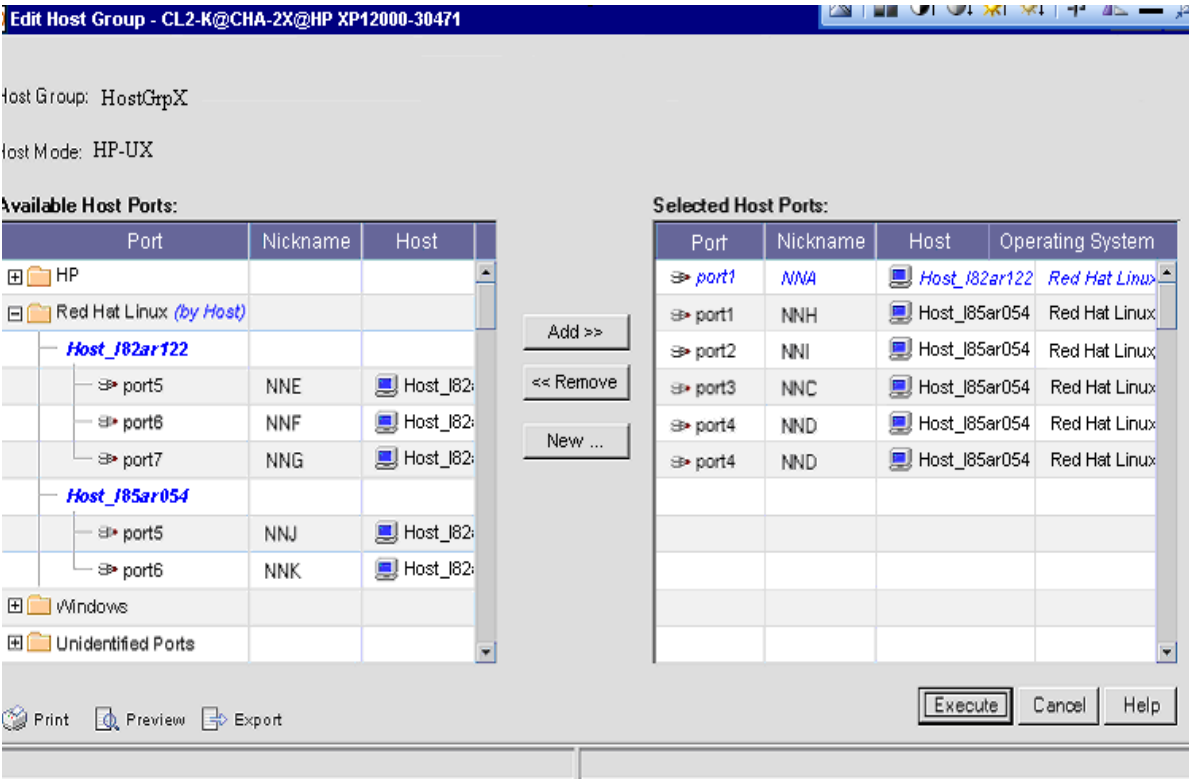


Figure 154 Add the host port to a host group

3. In the **Available Host Ports** table, selects the host port and clicks **Add** to move it to the Selected Host Ports table.

Note: The administrator could click **New** to create a new user-defined port.

4. Clicks **Execute**. The host port appears in the host group after the task has finished running on the Ionix ControlCenter Server.

Granting host access to storage

Now that port 1 on host l82ar122 has been added to host group, the administrator can grant the host port access to storage on the HP XP 12000 array.

To grant the host port access to storage, the administrator:

1. Right-clicks array **30471** and selects **Configure, Grant/Remove Access Rights**.

The **Masking** view appears (Figure 155 on page 176).

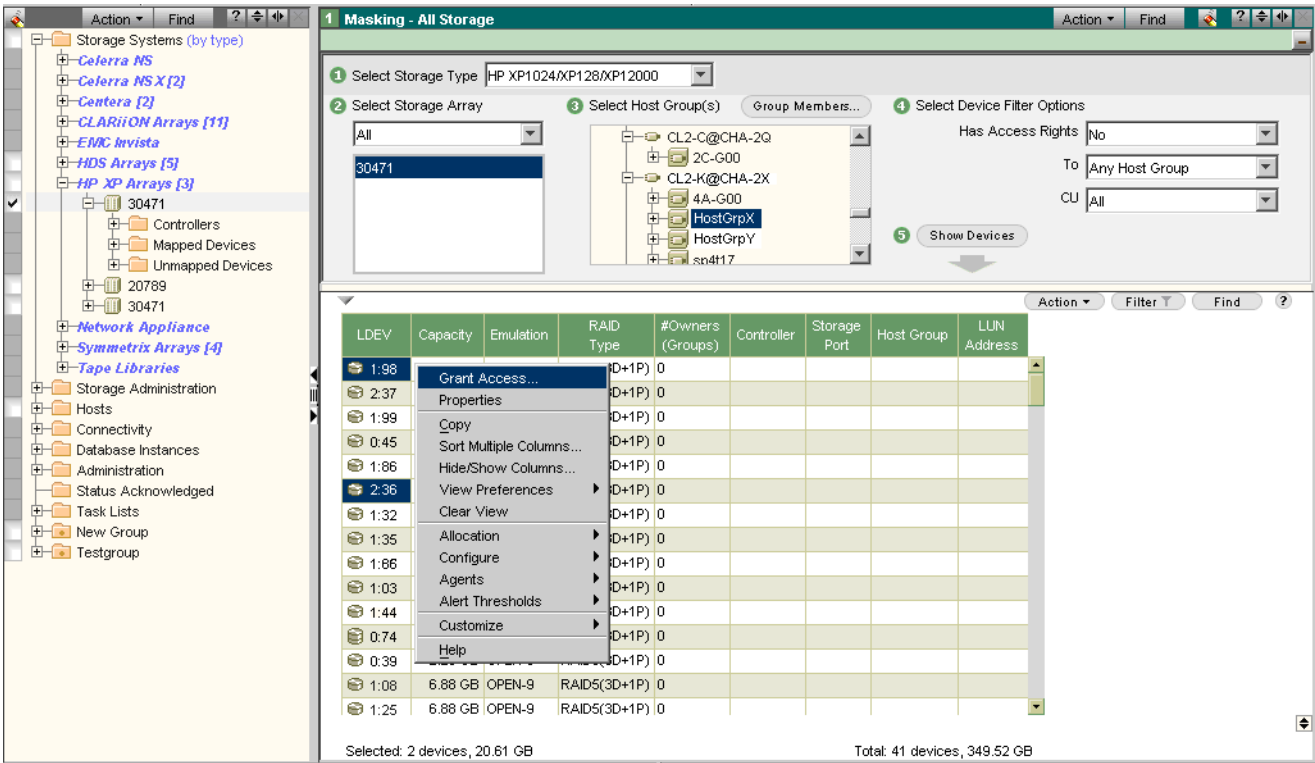


Figure 155 Granting the host port access to the LUSE

2. In the Masking view, performs the following actions:
 - a. For **1-Select Storage Type**, selects a storage array type **HP XP1024/XP128/XP12000**.
 - b. For **2-Select Storage Array**, chooses a filter from the drop-down list, if necessary, then selects array **30471**.
 - c. For **3-Select Host Groups**, selects **HostGrpX** in the tree window.
 - d. Uses the **4-Select Device Filter Options** to configure the rendering of logical devices (LDEVs) in the Masking view table.
 - e. Clicks **5-Show Devices** and displays the filtered LDEVs in the Masking view table.

Note: The administrator can drag an LDEV from Masking view into Path Details view to quickly identify all the hosts that have access to it.

- f. In the table, selects LDEVs **1:98** and **2:36**, right-clicks one of the selected LDEVs and selects **Grant Access**.

The **Masking wizard** appears (Figure 156 on page 177).



Figure 156 Assigning a LUN address to each LDEV

3. In the **Assign LUN Address** table, under the **Address** column, selects a LUN address for each LDEV.
4. Clicks **Next**.

Note: If the administrator had assigned invalid LUN addresses to the LDEVs, the **Invalid LUN Address** dialog box appears, listing LDEVs with invalid LUN addresses. For example, the same LUN address may have been chosen for two LDEVs in the same host group. In this case, clicks **OK** in the **Invalid LUN Address** dialog box, and reassigns the LUN addresses in the Masking wizard.

5. In step 2 of the Masking wizard, reviews the changes that are about to be committed to the ECC Server (Figure 157).

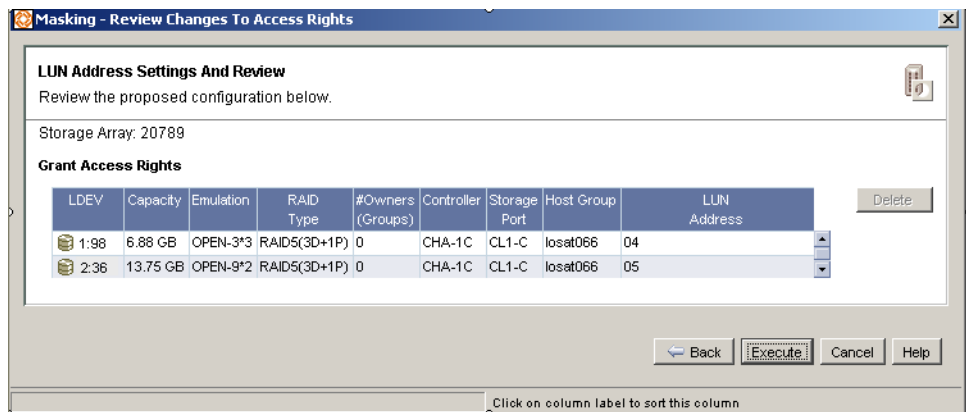


Figure 157 Reviewing the configuration changes before sending to the Ionix ControlCenter Server

6. Clicks **Execute**.

The grant access rights tasks are sent to the ECC Server for execution. A pop-up message indicates whether the operation has completed successfully or has failed.

Discovering host devices

The administrator has completed allocation of storage to the Web server and now updates the disk information on the host.

To do this, the administrator:

1. In the Console tree, right-clicks host **l82ar122** and selects **Host, Rescan Disks**.

Note: Host agent must be installed in order to see the **Hosts, Rescan Disks** option.

A login dialog box appears the first time during the session when an attempt is made to perform a command that requires user authentication on this host.

2. Enters the **Username** and **Password** that provide the necessary privileges to complete the rescan task on this host.
3. Once the rescan completes, right-clicks host **l82ar122** and selects **Rediscover**.

The Discover data collection policy runs, and the host information in the Console is updated.

4. On the Console toolbar, clicks the **Properties** button and displays the Properties view.
5. In the Console tree, expands host **l82ar122** and the folder **Host Devices**.
6. Drags the **Host Devices** folder into the Properties view to view the details.

Figure 158 shows the new host devices totaling 20.62 GB.

Panel number	Host Device	Host	Total	Free	% Free	Used?	Block Size	Device	Storage	Vendor	Product	# Cyls
	\\.\PHYSICALDRIVE13	l82ar122	9.16 GB	9.16 GB	100	No	0.50 KB	2:40	30471	HP	OPEN-3*4	
	\\.\PHYSICALDRIVE34	l82ar122	11.46 GB	11.46 GB	100	No	0.50 KB	2:36	30471	HP	OPEN-3*5	
			20.62 GB	20.62 GB	100							

Figure 158 Devices are now available to the web server

Deallocating storage from a host

This example demonstrates how a storage administrator uses Ionix ControlCenter Deallocation Wizard to deallocate, or remove, storage from a host.

In this scenario, the administrator allocated too much storage to Windows host l82at124 and now deallocates 40 GB of storage from the host. The Deallocation Wizard allows the administrator to remove the relationship between the host and specified storage devices to which it has access (as long as the objects are connected through Fibre Channel paths).

The administrator completes the following steps to deallocate storage:

- ◆ Determine the Amount of Free Space on the Host
- ◆ Determine the Host Devices to be Deallocated
- ◆ Start the Deallocation Wizard
- ◆ Create Deallocation Policies
- ◆ Select the Host
- ◆ Confirm the Objects and Select a Policy
- ◆ Select the Deallocation Paths
- ◆ Review and Execute the Task

Determine amount of free space available on host

The administrator uses Free Space view to determine the amount of free space on host l82at124. [Figure 159](#) shows that this host has a little over 48 GB of free space. The administrator decides to deallocate 40 GB from this host.

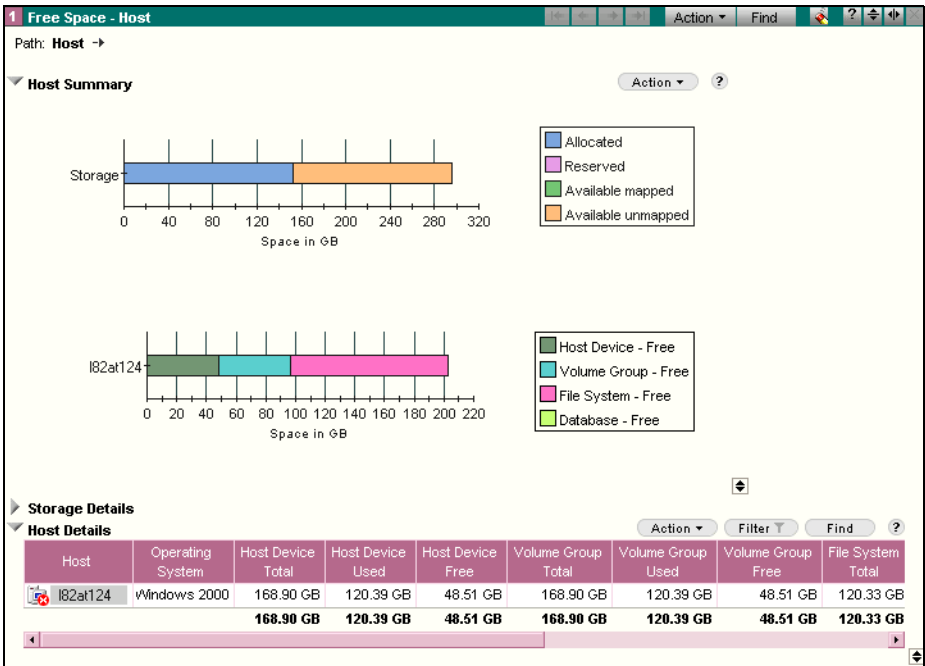


Figure 159 Free Space view of host l82at124

Starting the Storage Deallocation Wizard

The administrator starts the wizard as follows:

1. In the Console tree expands **Hosts**, **l82at124**, **Host Devices**, and highlights devices **c6t9d10** and **c6t8d11**.

In this case, the administrator had already determined which devices to deallocate. However, they could have simply selected host l82ar124 and used the wizard to determine which devices were not in use and could be safely deallocated.

2. Right-clicks the host and selects **Allocation, Deallocate**.

The **Storage Deallocation Wizard** starts (Figure 160).

The dialog box shows the hosts that were previously selected as well as any available deallocation policies.

The administrator can add objects by dragging them from the tree, or remove them by selecting the device and pressing **Delete**.

3. Clicks **New** to create a new policy.

The administrator could have used or edited the policy provided by Ionix ControlCenter as a default, or used or edited an existing policy available through the drop-down menu.

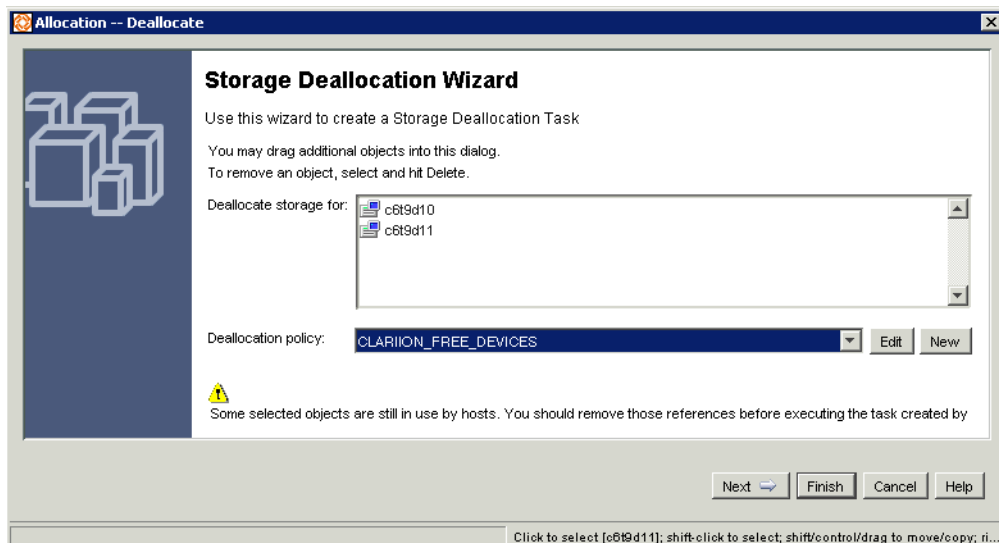


Figure 160 Starting Deallocation Wizard

Editing or creating the deallocation policy

Deallocation policies define the actions to be performed during the deallocation task, such as rediscovering a host, unmapping devices from the front end of a storage array, and dissolving metadevices.

A default Deallocation Policy is provided but the Administrator creates a new policy using the Deallocation Policy Editor (Figure 161).

To access the Deallocation Policy Editor go to Storage Administration > Deallocation Policies. Right click and select New > Deallocation Policy.

To create the new policy, the administrator:

1. Names the policy **CLARIION_FREE_DEVICES**, and ensures that **Use this policy as system default** is cleared.

This is a policy unique to CLARiiON array deallocations and will not be the standard policy that the administrator uses to deallocate storage for every array.

2. Ensures that **Disable Host Actions** is cleared, and selects **Before Executing Tasks, Rediscover host and fail on error**.

This means that the wizard checks which devices are currently in use, and will fail the deallocation task if storage is still in use by the host.

3. Selects **After Executing Tasks, Rediscover Hosts**.

This tells Ionix ControlCenter to rediscover the host after the deallocation and update the Repository so all users will see accurate data about the host.

4. Selects **Array Actions, Delete device**.

This deletes any deallocated devices that are no longer part of *any* path.

5. Clicks **Save** to save the new policy and return to the **Allocation -- Deallocate** dialog box.

6. Ensures that the (**CLARIION_FREE_DEVICES**) deallocation policy is selected and clicks **Next**.

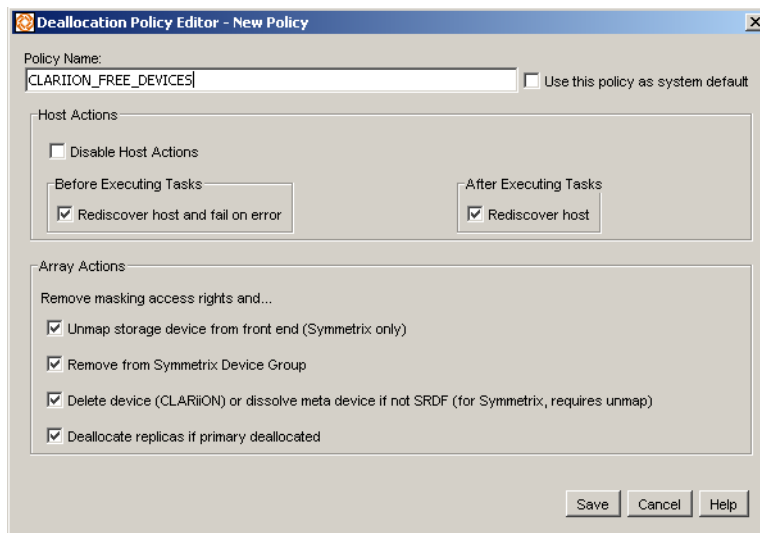


Figure 161 Create a new deallocation policy

Selecting allocation paths

The Paths to Deallocate dialog box displays the available paths to be deallocated based on the objects that were selected in the previous screen. In this case, a total of four paths to host devices c6t9d10 and c6t8d11 will be deallocated ([Figure 162](#)).

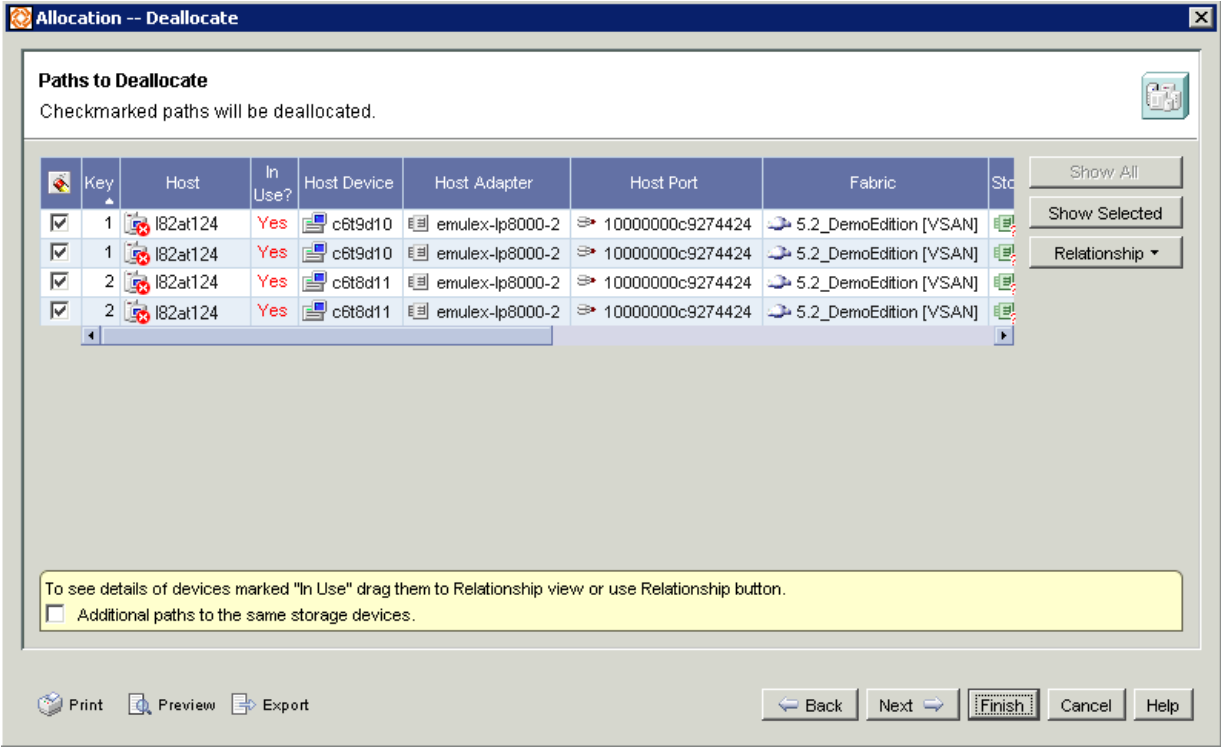


Figure 162 Paths to be deallocated

The administrator confirms that the paths are correct and clicks **Next**.

The **Review Deallocation Task** dialog box appears.

Reviewing and executing the deallocation task

The Review Deallocation Task dialog box provides summaries of the Deallocation Policy and the Paths to Deallocate (Figure 163 on page 185).

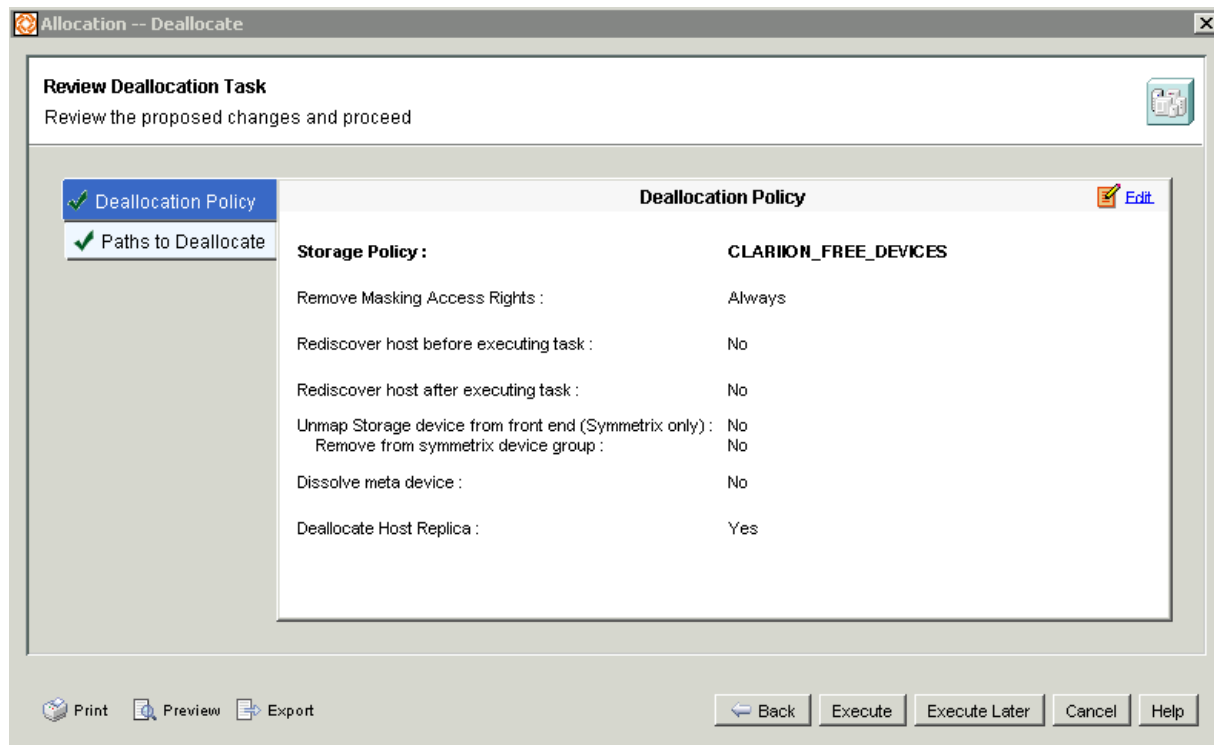


Figure 163 Review Deallocation Task

The administrator completes the deallocation task as follows:

1. Reviews the summaries and clicks **Execute**.
The **Execute Now** dialog box appears.
2. Creates a Task List name, selects **View progress/status of tasks**, and clicks **OK**.
The deallocation begins.
3. Follows the progress of the deallocation in the **Properties - Task List Viewer**.

[Figure 164 on page 186](#) shows the completed task.

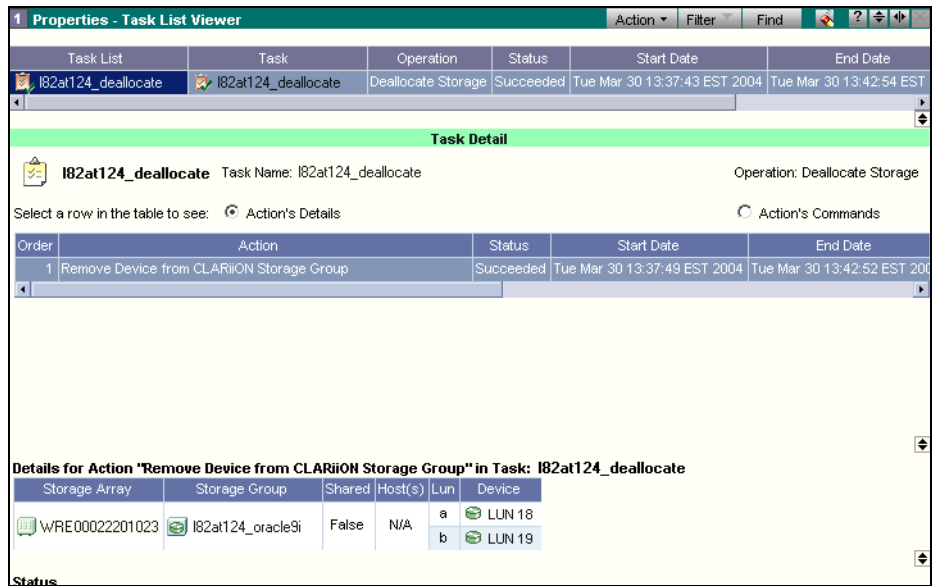


Figure 164 Deallocation succeeded

The administrator verifies that the deallocation was successful by comparing the initial Free Space View to Free Space View of the host after the deallocation. [Figure 165](#) shows that the Host Device free space is now 8.52 GB as opposed to 48.51 GB before the deallocation ([Figure 159 on page 180](#)). 40 GB was successfully deallocated.

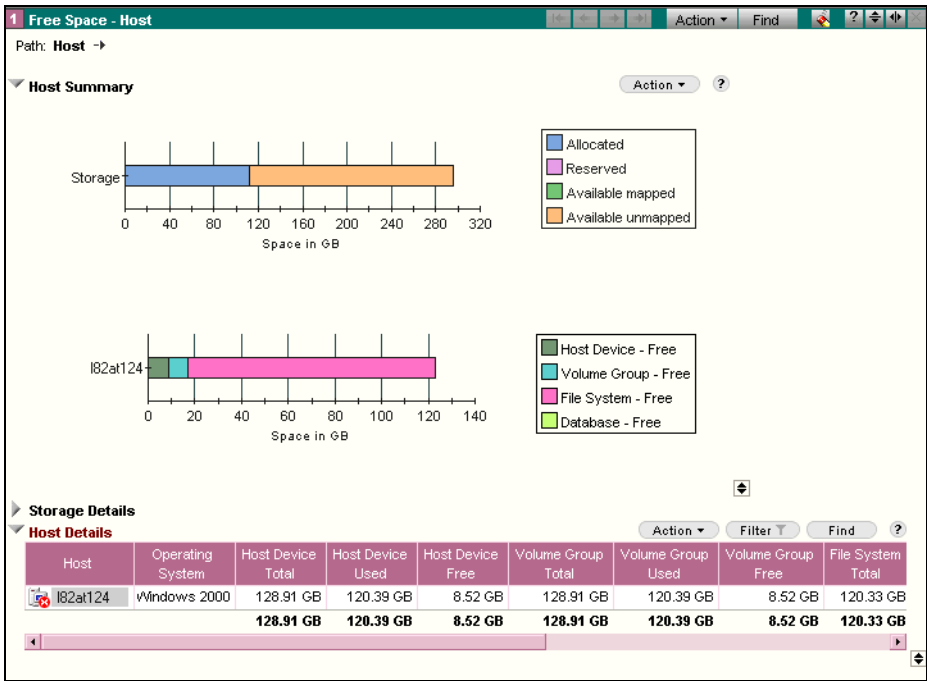


Figure 165 Free Space view showing successful deallocation

Allocating storage using AutoPath

In “Allocating CLARiiON devices (LUNs) to a host” on page 155, a storage administrator added storage to a host connected to a CLARiiON array using the standard method of allocating storage with Ionix ControlCenter. In this scenario, the administrator intends to allocate storage that is already mapped to a port on the CLARiiON array, but uses an Ionix ControlCenter wizard called Autopath to streamline the zoning and LUN masking portion of the storage allocation process.

The administrator completes the following tasks to allocate storage from the CLARiiON array using AutoPath:

- ◆ Determines if storage is available on the CLARiiON array
- ◆ Ensures the CLARiiON is accessible from the host
- ◆ Uses the AutoPath Wizard to establish the path between host and array by setting up zoning and LUN masking

- ◆ Adds LUNs to an existing storage group (or creates one) so the host sees the LUNs

Determining if storage is available on the CLARiiON array

The administrator uses Properties view to determine if mapped storage is available on the CLARiiON array.

To do this, the administrator:

1. In the Console tree, expands the folders **Storage Systems, CLARiiON**.
2. Right-clicks the array and selects **Properties**.

The CLARiiON properties appear in Properties view (Figure 166). This view shows that there is over 3000 GB of locally unallocated capacity available.

CLARiiON	S/N	Vendor	Model	Physical Capacity	Configured	Unconfigured	Allocated	UnAllocated	# LUNs	#
WRE00022201023	WRE00022201023	EMC	CX600	5,997.48 GB	1,573.68 GB	3,798.40 GB	573.21 GB	3,135.24 GB	36	
				5,997.48 GB	1,573.68 GB	3,798.40 GB	573.21 GB	3,135.24 GB	36	

Figure 166 CLARiiON array properties

3. In the Console tree, expands the CLARiiON array.
4. Drags the mapped LUNs into the Properties view.
5. Sorts on the configuration column by clicking the column heading to show the RAID-level protection of the LUNs (Figure 167).

CLARiiON	LUN Name	LUN ID	UID	Configuration	Replication Type	Drive Ty
WRE00022201023	LOSBD177 - LUN 8	0008	60:06:01:60:B6:C6:09:00:BD:9B:B1:80:5E:51:DA:11	RAID5	N/A	Fibre Cha
	LOSBD177 - LUN0	0000	60:06:01:60:B6:C6:09:00:BB:9B:B1:80:5E:51:DA:11	RAID5	N/A	Fibre Cha
	LUN 2	0002	60:06:01:60:41:2E:09:00:57:21:6D:CE:8E:50:DA:11	RAID5	N/A	Fibre Cha
	LOSBD177 - LUN 80	0080	60:06:01:60:B6:C6:09:00:CD:17:86:16:77:F4:D9:11	N/A	N/A	Fibre Cha

Figure 167 CLARiiON LUN properties

Determining if type of connection is available

The administrator uses Topology view to verify that Fibre Channel connections to the array exist.

To do this, the administrator:

1. Clicks the **Topology** button on the Console toolbar.
2. In the Console tree, expands the folders **Storage Systems, CLARiiON**.
3. Drags array WRE00022201023 into the Topology view.
4. Drags hosts l82ar134 and l82AR136 into the Topology view.
5. Turns on **Show Links** to ensure that the cabling is in place between host l82ar136 and the CLARiiON array in this fabric (Figure 168 on page 189).

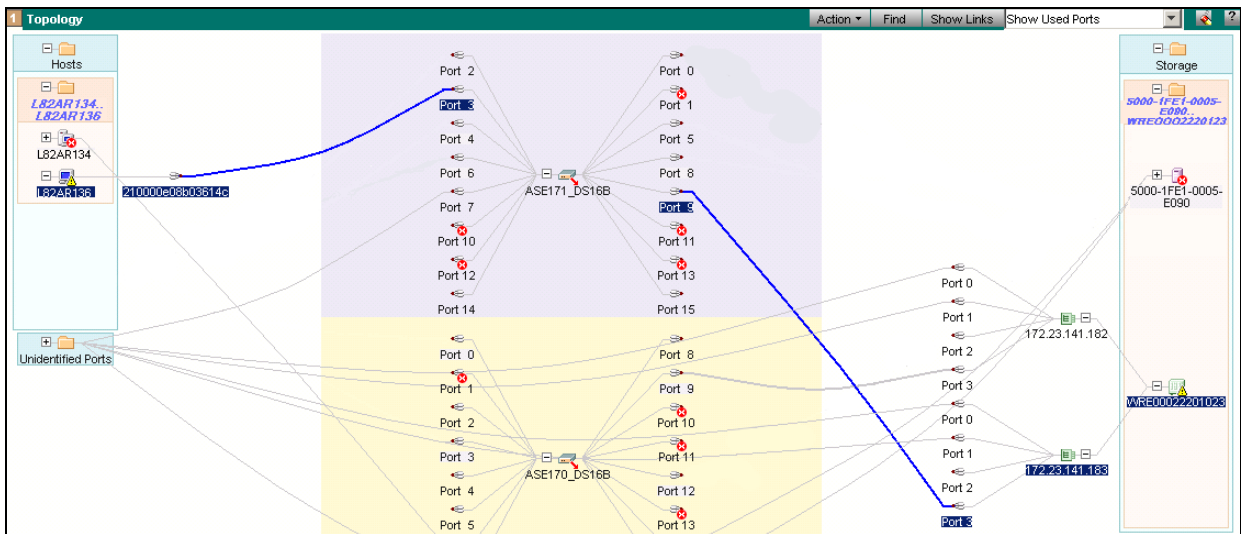


Figure 168 Verify that a fibre channel connection exists using topology view

Configuring the connection

The administrator determined in the previous section that mapped LUNs are available for allocation. Now the administrator checks to see if a zoned path exists between the host and array. If the path does not exist, the administrator will use AutoPath to create one.

Checking for existing path between host and array

The administrator checks for an existing path as follows:

1. On the Console toolbar, clicks **Storage Allocation** and selects **Path Details** from the drop-down menu.
2. Drags the host into the Path Details view.

There are no paths associated with this host (Figure 169 on page 190).

3. Clicks the **Relationship** view button.
4. Drags the host into the Relationship view.

There is no path between the host and the array.

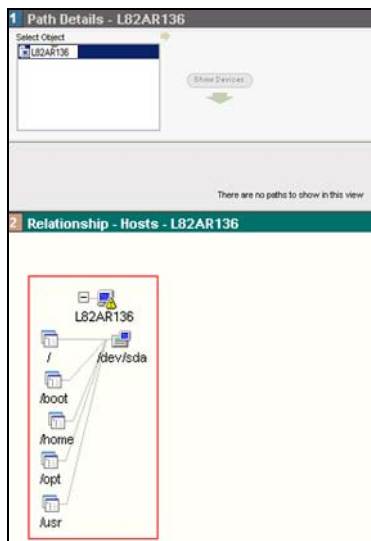
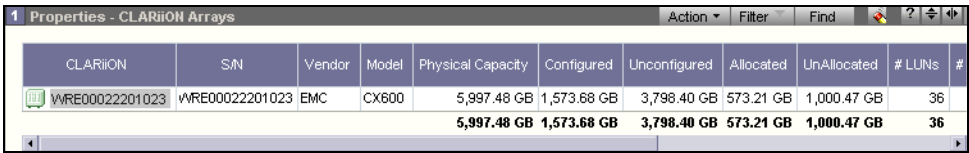


Figure 169 Path Details showing no zoned paths between host and target array

Confirming storage allocation

Once the task succeeds, the administrator uses Properties view on the CLARiiON array to confirm that additional storage was allocated (Figure 170).



CLARiON	S/N	Vendor	Model	Physical Capacity	Configured	Unconfigured	Allocated	Unallocated	# LUNs	#
WRE00022201023	WRE00022201023	EMC	CX600	5,997.48 GB	1,573.68 GB	3,798.40 GB	573.21 GB	1,000.47 GB	36	
				5,997.48 GB	1,573.68 GB	3,798.40 GB	573.21 GB	1,000.47 GB	36	

Figure 170 Properties view showing new storage allocated to host

Discovering host devices

The administrator has completed storage allocation and now updates the disk information on the host after the configuration change.

To do this, the administrator:

1. In the Console tree, right-clicks host **l82ar136** and selects **Host, Rescan Disks**.

Note: Host agent must be installed in order to see the **Hosts, Rescan Disks** option.

A login dialog box appears the first time during the session when an attempt is made to perform a command that requires user authentication on this host.

2. Enters the **Username** and **Password** that provide the necessary privileges to complete the rescan task on this host.
3. Once the rescan completes, right-clicks host **l82ar136** and selects **Rediscover**.

The Discover data collection policy runs, and the host information in the Console is updated.

CHAPTER 5

Virtual Provisioning of Your Symmetrix Devices

Virtual Provisioning is EMC's implementation of thin provisioning. EMC Ionix ControlCenter 6.1 can be used to provision, monitor, and report the usage of virtually provisioned devices. The information provided in this chapter is specific for datacenters that use Symmetrix DMX-3 or DMX-4 storage arrays with Enginuity 5773 or Symmetrix V-Max with Enginuity 5874, and use Ionix ControlCenter to manage their information infrastructure.

This chapter contains the following scenarios:

- ◆ [Creating, mapping, and masking Symmetrix thin devices to a host 194](#)
- ◆ [Monitoring Symmetrix thin pool utilization using Ionix ControlCenter alerts 227](#)
- ◆ [Reporting on virtual provisioned storage using StorageScope..... 227](#)
- ◆ [Analyzing performance of virtually provisioned storage 247](#)

Creating, mapping, and masking Symmetrix thin devices to a host

This example demonstrates how a storage administrator uses Ionix ControlCenter and SMC (Symmetrix Management Console) to establish Virtual Provisioning TM.

Creating new thin pool device from Ionix ControlCenter

The storage administrator logs in to Ionix ControlCenter Console and performs the following tasks:

1. From the Console tree view, expands the folders **Storage Systems, Symmetrix**.

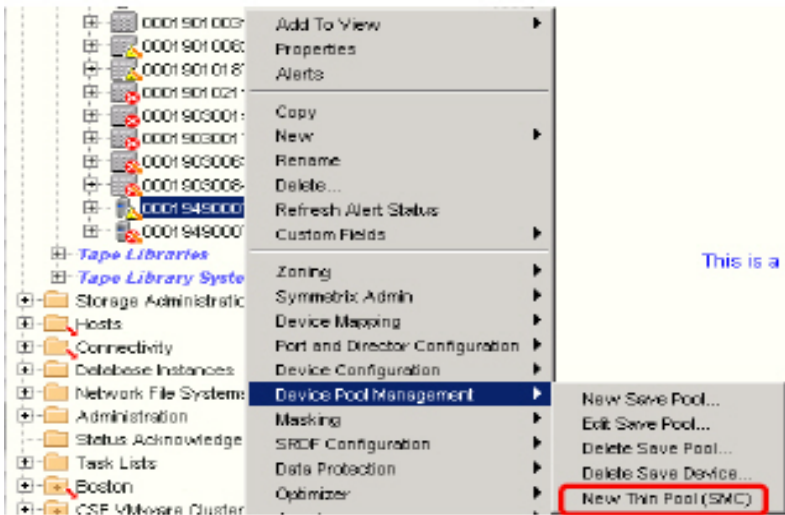


Figure 171 Launch of SMC from console tree

2. Finds the Symmetrix array running Enginuity TM 5773 or later.
3. Right-clicks on the Symmetrix SID and selects **Device Pool Management, New Thin Pool (SMC)** (Figure 171).

The **SMC Launch** dialog box opens with the available SMC server options. The **SMC Console Launch** dialog box lists all SMC Servers registered with this Symmetrix array in the list box (Figure 172).

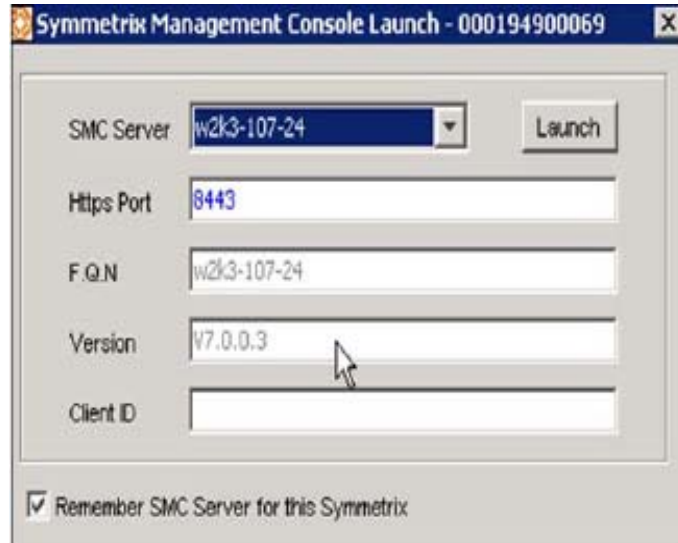


Figure 172 SMC launch dialog box

4. Selects the preferred SMC Server. The SMC configured https port automatically fills in.
5. Checks **Remember SMC Server for this Symmetrix**.
6. Enters the **Client ID**.
7. Clicks **Launch**.

Log in to SMC will be automatic and the **Device Pool Management - Create Device Pool** dialog box opens (Figure 172).

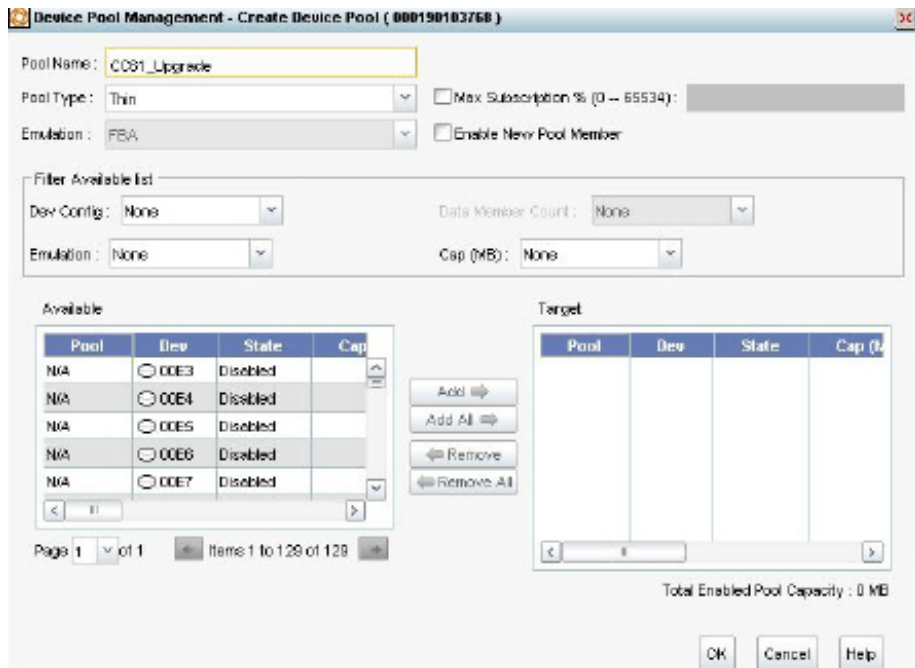


Figure 173 Create Device Pool dialog

8. Enters the following in the CreateDevice Pool dialog:

- **Pool Name** — CC61_Upgrade

Note: Special characters and spaces are not allowed in **Pool Name** field.

- **Pool Type** — Selects **Thin**
- **Emulation** — Selects **FBA**
- Clicks **OK** and acknowledges the message stating “**Successfully created Thin pool.**”

Verifying thin pool creation

In SMC Console

1. From tree view, expands the **Pools, Thin Pools** folders for the Symmetrix array that the new thin pool was created on and confirms the new thin pool **CC61_Upgrade** ([Figure 174 on page 197](#)).

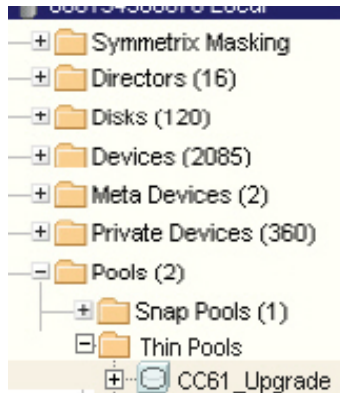


Figure 174 Expanded pools folder in SMC

In Ionix ControlCenter Console

From the tree view, expands the **Pools, Thin Pools** folders for the Symmetrix that the new thin pool was created on and views the new thin pool **CC61_Upgrade** (Figure 174 on page 197).

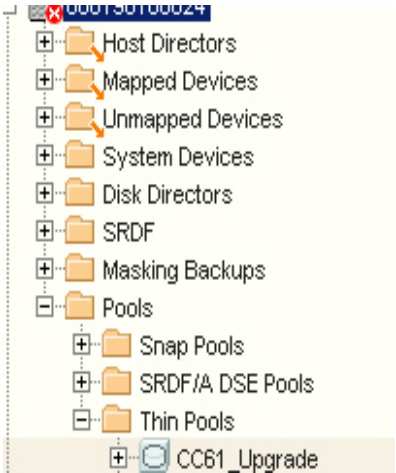


Figure 175 Expanded pools folder in Ionix ControlCenter

2. From the menu selects the **Properties** view.
3. Selects and drags the newly created thin pool **CC61_Upgrade** into the **Properties** view (Figure 176 on page 198).

A screenshot of the 'Properties' view in Ionix ControlCenter. It displays a table for the 'Data Pool' with columns: Pool, Total Capacity, Used Capacity, Free Capacity, Total Capacity Allocated, Percent Full, #Devices in Pool, Protection, and #End Devices. The row for 'CC61_Upgrade' is highlighted. Below the table, summary statistics are shown: 4.69 GB Total Capacity, 7.50 MB Used Capacity, 4.68 GB Free Capacity, and 4.69 GB Total Capacity Allocated.

Pool	Total Capacity	Used Capacity	Free Capacity	Total Capacity Allocated	Percent Full	#Devices in Pool	Protection	#End Devices
CC61_Upgrade	4.69 GB	7.50 MB	4.68 GB	4.69 GB	0	5	2-Way Mir	5
4.69 GB 7.50 MB 4.68 GB 4.69 GB								

Figure 176 Thin Pool displayed in Properties view

Note: Changes will not be reflected in StorageScope until the ETL process is run. This is scheduled once a day at 4 A.M. (default) but can also be manually run.

Creating data devices from Ionix ControlCenter

To create data devices the System Administrator performs the following tasks:

1. From the Ionix ControlCenter Console tree view, right-clicks the **Symmetrix SID** and selects **Device Configuration, Create Device (SMC)**.

SMC launches and the **Device Configuration – Create Device** dialog box opens (Figure 177 on page 199).

Device Configuration - Create Device (000190100024)

Regular Device | Thin Device | **Data Device** | Save Device

Number of Devices : 5

Configuration : 2-Way Mir

Data Member Count : NONE

Emulation : FBA

Capacity for each device : 1024 Cyl (960 MB)

Disk Group Number : Any Available Disk

Device State in Pool : Enabled

Add to Pool :

Figure 177 Create Device dialog box

2. Clicks the **Data Device** tab.
3. Enters the following in the Data Device dialog:
 - Number of Devices — 5
 - Configuration — 2-way Mirror

- Emulation — FBA
- Capacity — 1024 Cyl (960 MB data device)
- Disk Group Number — Any Available Disk
- Device State in Pool — Enabled
- Add to pool — clicks **Select** to open the **Select Device Pool** dialog box (Figure 178 on page 200).

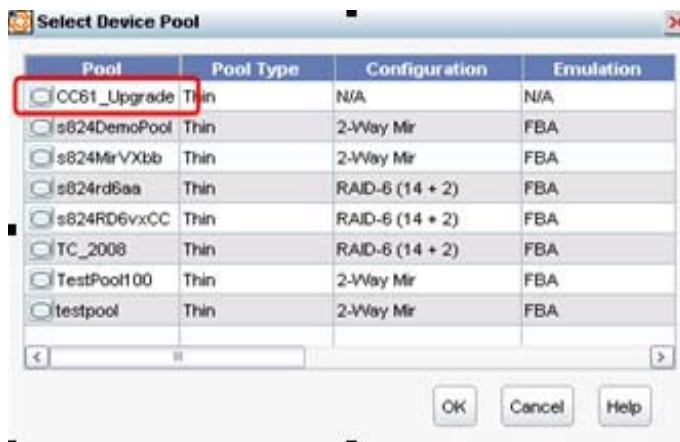


Figure 178 Select Device Pool dialog box

4. Selects the pool named **CC61_Upgrade** and clicks **OK** to fill in the pool name in the **Create Device** dialog box.
5. Clicks **Add to Config Session List** and the **Config Session** dialog box opens (Figure 179 on page 201).

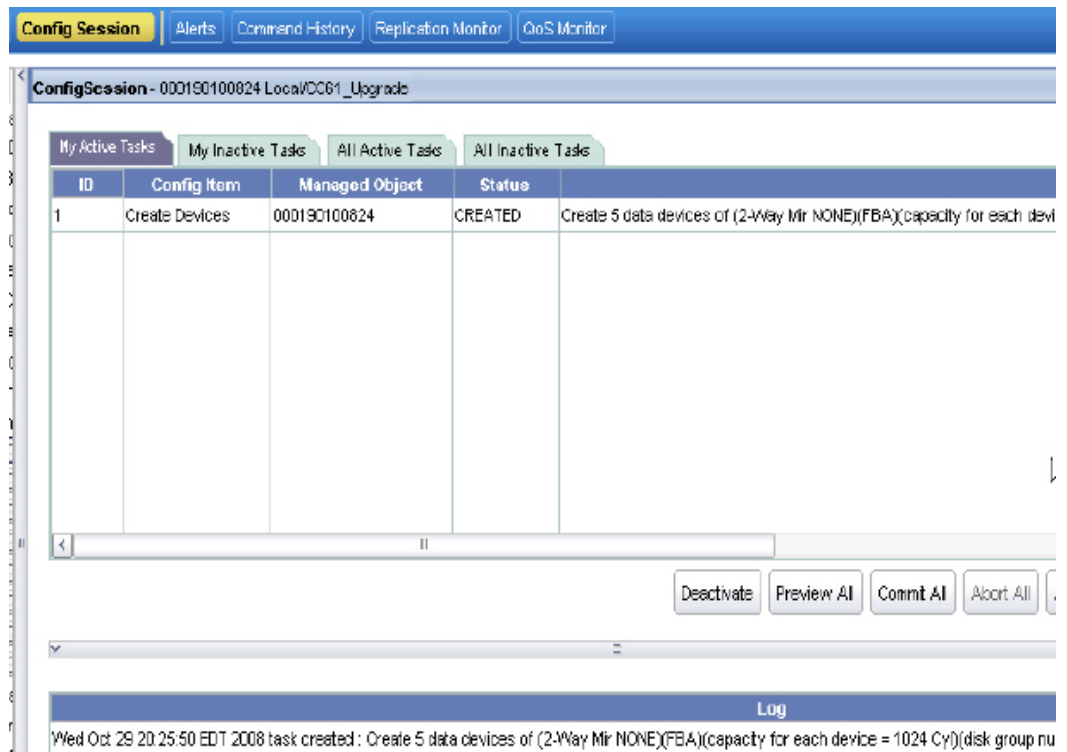


Figure 179 Config Session dialog/ My Active Tasks

6. Reviews the **My Active Tasks** tab to verify the parameters for the device creation then clicks **Commit All**.
7. Acknowledges the pop-up information boxes by selecting **Yes**.
8. Checks the **Log** window for the completion of the Sym Config Session ([Figure 180 on page 202](#)).



Figure 180 SMC Log window

Verifying data device creation

In SMC Console

1. From the tree view, expands the **Pools, Thin Pools** folders for the Symmetrix array that the new data devices were created on and selects the thin pool **CC61_Upgrade**.
2. Clicks the **Properties** tab below the menu bar.
The **CC61_Upgrade** thin pool data appears under the **General** tab:.
3. Observes the Enabled, Allocated, and Free capacity of the thin pool.
4. Observes the Allocated % and the Current and Maximum Subscription %.

In Ionix ControlCenter Console

1. From the tree view, expands the **Pools**, **Thin Pools** folders, and expands the thin pool **CC61_Upgrade** and views the new data devices ([Figure 181 on page 203](#)).

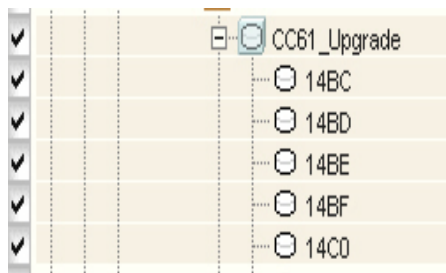


Figure 181 Expanded thin pool with data devices

2. From the menu selects **Properties** view.
3. Multi-selects the five data devices and drags them into the **Properties View** ([Figure 182 on page 203](#)).

1 Properties						
Data Pool						
Pool	Total Capacity	Used Capacity	Free Capacity	Total Capacity Allocated	Percent Full	#Devices
CC61_Upgrade	4.69 GB	7.50 MB	4.68 GB	4.69 GB	0	5
	4.69 GB	7.50 MB	4.68 GB	4.69 GB		
Standard View						
Symmetrix	LUN Name	ID	Configuration	LUN Capacity	Meta Size	Allocated
000190100824	14BC	14BC	2-Way Mir	0.94 GB	N/A	System Allocated
	14BD	14BD	2-Way Mir	0.94 GB	N/A	System Allocated
	14BE	14BE	2-Way Mir	0.94 GB	N/A	System Allocated
	14BF	14BF	2-Way Mir	0.94 GB	N/A	System Allocated
	14C0	14C0	2-Way Mir	0.94 GB	N/A	System Allocated

Figure 182 Data devices displayed in Properties view

4. Confirms each Data Device has a LUN Capacity (0.94 GB) and compares this to the information shown in the **SMC Data Devices** tab.

Creating and Binding thin devices to a pool

To create and bind thin devices to a pool, the system administrator performs the following tasks:

1. From Ionix ControlCenter tree view, right-clicks on the **Symmetrix SID** and selects **Device Configuration > Create Device (SMC)**.
2. SMC launches and the **Device Configuration – Create Device** dialog box opens ([Figure 183 on page 204](#)).

Device Configuration - Create Device (000190100824)

Regular Device | **Thin Device** | Data Device | Save Device

Number of Devices: 10

Configuration: TDEV

Emulation: FBA

Capacity for each device: 1024 Cyl (960 MB)

RDF Group Number: Select ...

Remote Configuration: TDEV

Remote SSD: Select ...

Dynamic Capability: NONE

Bind to Pool: CC61_Upgrade Select ...

Remote Pool: Select ...

Preallocated Capacity for each device: Cyl (MB)

Add to Config Session List Cancel Help

Figure 183 Create thin device dialog

3. Clicks the **Thin Device** tab.
4. Enters the following in the **Thin Device** dialog box:
 - Number of Devices — 10
 - Configuration — TDEV
 - Emulation — FBA
 - Capacity for each device — 1024 Cyl (960 MB data device)
 - Bind to pool — CC61_Upgrade
 - Preallocated Capacity for each device — Leave this field blank
5. Clicks **Add to Config Session List** and the **Config Session** dialog box opens.
6. Reviews the **My Active Tasks** tab to verify the parameters for the device creation then clicks **Commit All**.
7. Acknowledges the pop-up information boxes by selecting **Yes**.
8. Checks the **Log** window for the completion of the Sym Config Session.

Verifying thin device creation

In Ionix ControlCenter Console

1. From the tree view, expands the **Pools**, **Thin Pools** folders, then expands the thin pool **CC61_Upgrade** and views the new thin devices ([Figure 184 on page 206](#)).

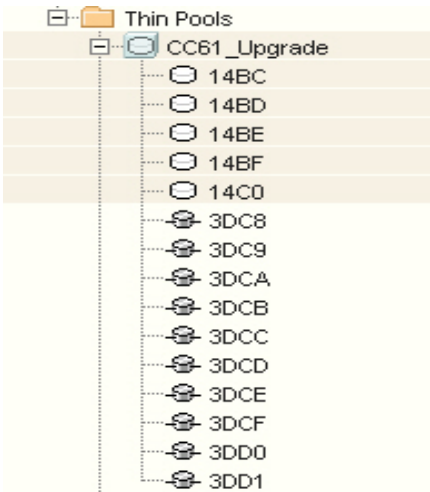


Figure 184 Expanded thin pool with thin devices

2. From the menu selects **Properties View**.
3. Selects and drags the thin pool **CC61_Upgrade** into the **Properties View**.
4. Observes the **Total Allocated Capacity** for CC61_Upgrade (Figure 185 on page 206).

The screenshot shows the 'Properties' window for the 'Data Pool' section. It contains a table with columns for Symmetrix ID, Pool name, Total Capacity, Used Capacity, Free Capacity, Total Capacity Allocated, Percent Full, and #Devices in Pool. The table lists the 'CC61_Upgrade' pool with its associated capacity and device count. Summary values are provided at the bottom of the table.

Symmetrix	Pool	Total Capacity	Used Capacity	Free Capacity	Total Capacity Allocated	Percent Full	#Devices in Pool
000190100824	CC61_Upgrade	4.69 GB	7.50 MB	4.68 GB	9.38 GB	0	5
		4.69 GB	7.50 MB	4.68 GB	9.38 GB		

Figure 185 Thin Pool with bound thin devices in Properties view

- From the tree view, right-clicks thin pool **CC61_Upgrade** selects **Arrange By > Type** and groups devices into **DATA Devices** and **Standard Thin Devices** (Figure 186 on page 207).



Figure 186 Grouped data devices and thin devices





Note: Thin devices may be listed as Standard Thin Devices, Meta Thin Devices, R1 Thin Devices, R2 Thin Devices, Meta R1 Thin Devices, or Meta R2 Thin Devices.

- From the tree view, selects and drags the **Standard Thin Devices** and the **DATA Devices** into the **Properties View** and displays these devices in the **Standard View** table (Figure 187 on page 208).

7. Reviews the Configuration, LUN Capacity, and Allocated columns and observes the differences between the Data Devices and TDevs.

1 Properties

Action





Data Pool

Action

Filter

Find

?

Symmetrix	Pool	Total Capacity	Used Capacity	Free Capacity	Total Capacity Allocated	Percent Full	#Devices in Pool
 000190100824	 CC61_Upgrade	4.69 GB	7.50 MB	4.68 GB	9.38 GB	0	5
		4.69 GB	7.50 MB	4.68 GB	9.38 GB		

Standard View

Action

Filter

Find

Symmetrix Devices

?

















Symmetrix	LUN Name	ID	Configuration	LUN Capacity	Meta Size	Allocated
 000190100824	 14BC	14BC	2-Way Mir	0.94 GB	N/A	System Allocated
	 14BD	14BD	2-Way Mir	0.94 GB	N/A	System Allocated
	 14BE	14BE	2-Way Mir	0.94 GB	N/A	System Allocated
	 14BF	14BF	2-Way Mir	0.94 GB	N/A	System Allocated
	 14C0	14C0	2-Way Mir	0.94 GB	N/A	System Allocated
	 3DC8	3DC8	TDEV	0.94 GB	N/A	Unallocated
	 3DC9	3DC9	TDEV	0.94 GB	N/A	Unallocated
	 3DCA	3DCA	TDEV	0.94 GB	N/A	Unallocated
	 3DCB	3DCB	TDEV	0.94 GB	N/A	Unallocated
	 3DCC	3DCC	TDEV	0.94 GB	N/A	Unallocated
	 3DCD	3DCD	TDEV	0.94 GB	N/A	Unallocated
	 3DCE	3DCE	TDEV	0.94 GB	N/A	Unallocated
	 3DCF	3DCF	TDEV	0.94 GB	N/A	Unallocated
	 3DD0	3DD0	TDEV	0.94 GB	N/A	Unallocated
	 3DD1	3DD1	TDEV	0.94 GB	N/A	Unallocated

Figure 187 Data devices and thin devices displayed in Properties view

8. Observes that the Data Devices are **System Allocated**. This is a new allocation term. Data devices are internal to the Symmetrix array, and when a data device is configured and enabled it is **System Allocated**.
9. Observes that the **Data Pool** now displays five data devices in the pool with a total capacity of 4.69 GB.
10. Observes the **Total Capacity Allocated** of the 10 TDevs (9.38 GB) and the **Percent Full**.
11. Observes the **Used Capacity** (7.50 MB). This reflects the capacity of the pool that is consumed through the configuration of the thin pool.

In SMC Console

Selects the `CC61_Upgrade` Properties, Bound Thin Devices to observe the new thin devices.

Mapping thin devices to host

To map thin devices to the host, the system administrator performs the following tasks:

1. From the Ionix ControlCenter Console tree view, expands the **Pools, Thin Pools** folders, then expands the thin pool **CC61_Upgrade**.
2. Selects the TDevs to be mapped, then right-clicks on the TDevs and selects **Device Mapping > SDR Device Mapping**.
3. Acquires a lock on the TDevs and clicks **Yes** on the **SDR Mapping** warning that displays.
4. Enters the following in the **SDR Device Mapping** dialog box ([Figure 188 on page 210](#)):
 - a. Select Devices — Expands **Unmapped Devices** and selects the listed TDevs.
 - b. Select a Port — Expands the **Host Directors** and selects an FA port.

- c. Clicks **Move** then clicks **OK** on the **SDR Device Mapping - Move** warning that displays.

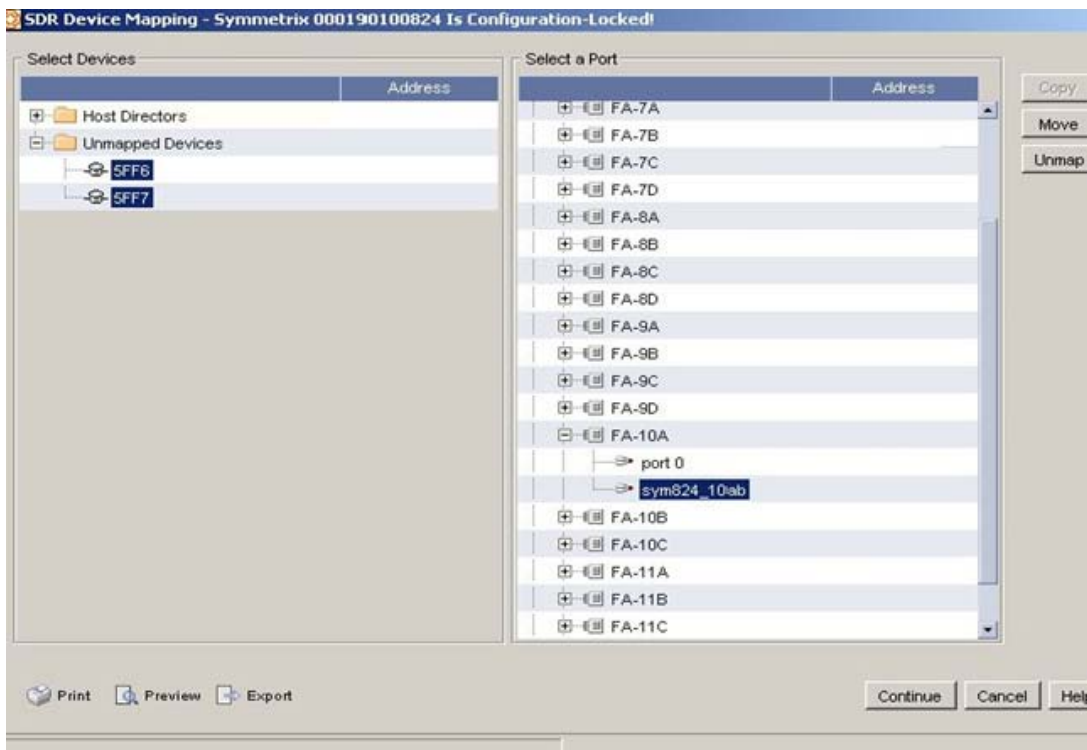


Figure 188 SDR device mapping dialog

5. When the devices have successfully been moved, clicks **Continue** to move to the next screen.
6. Reviews mapping information then clicks **Execute**.
7. Answers **Yes** to the pop-up window, then clicks **OK** after the mapping operation completes successfully.
8. Clicks **Close** to return to the Ionix ControlCenter console.

Verifying mapped thin devices

To verify the mapped thin devices:

1. From the Ionix ControlCenter Console tree view, expands the **Pools, Thin Pools** folders, then expands the thin pool **CC61_Upgrade**.

2. Verifies the reservation lock icon on the TDevs (Figure 189 on page 211).

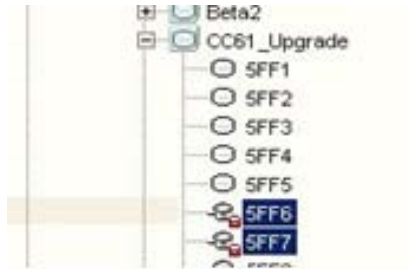


Figure 189 TDevs displayed in tree view with locked icon

Note: Symmetrix arrays can change the configuration after being discovered. These changes are updated in Ionix ControlCenter after the Symmetrix Agent configuration polling executes. The Configuration Data Collection Policies define the frequency that the Symmetrix agent will poll known Symmetrix units for configuration changes. Reservation locks are cleared by the Storage Agent for Symmetrix Configuration DCP, which runs every 10 minutes by default

3. In the tree view, from the Symmetrix array folder expands the **Host Directors** folder, expands host director **FA-10A**, port number **Sym824_10AB** and verifies that the assigned thin devices are mapped to the port (Figure 190 on page 212).

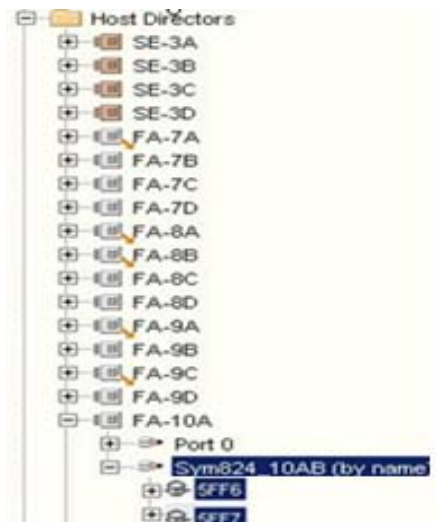


Figure 190 Mapped thin devices displayed under assigned port

Masking thin devices to host

To mask thin devices, the System Administrator performs the following tasks:

1. From the Ionix ControlCenter Console, clicks the drop-down menu next to **Storage Allocation** on the Ionix ControlCenter menu bar, and selects **Masking** view.
2. Clears any checked boxes in the tree view and selects the host that is mapped to the thin devices and drags it into the **Masking** view.

Note: If the SAN is not discovered, then no array will be populated in the Masking View. Select **All SAN Storage** from the **Select Storage Type** drop-down menu. You will also need to know the FA port the host is using.

3. Enters the following in the Masking View dialog ([Figure 192 on page 214](#)):
 - Select Storage Type — Symmetrix
 - Select Storage Array — Selects desired the Symmetrix SID
 - Select Storage Port — Selects desired storage port name

4. Clicks **Show Devices** and displays all of the devices mapped to this FA port with all devices masked to this host highlighted in green.
5. Multi-selects the thin devices 5FF6 and 5FF7, right-clicks on selected devices and selects **Grant Masking** to open the **Modify Masking Configurations** dialog (Figure 191 on page 213).

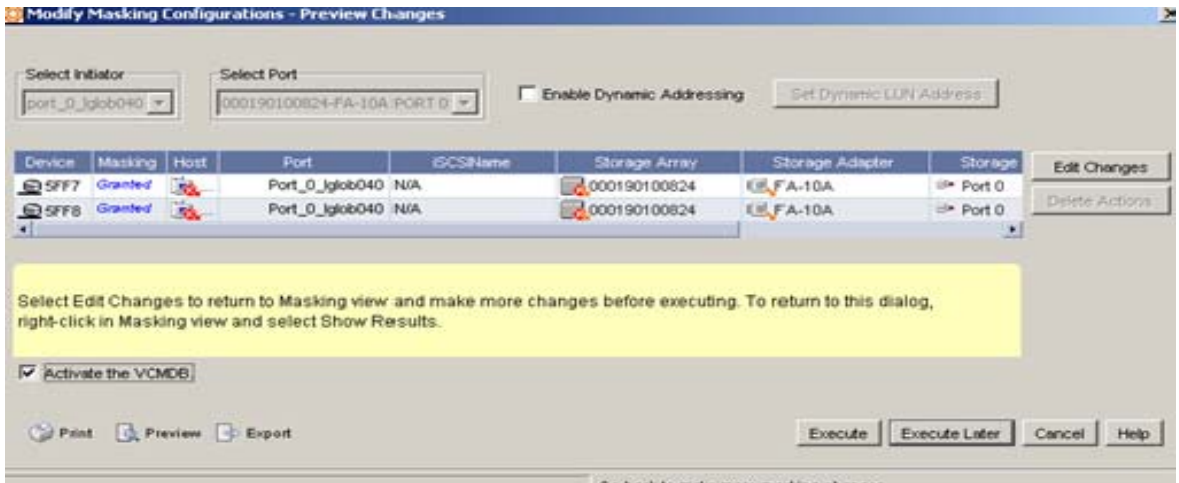


Figure 191 Thin devices granted masking in Modify Masking Configurations view

6. Selects the **Initiator** (will be automatically populated if the SAN is discovered).
7. Selects the **Activate the vcldb** checkbox.
8. Clicks **Execute**.

Upon completion, displays the new thin devices highlighted in green, indicating that the masking has been granted and the host can now see the devices (Figure 192 on page 214).

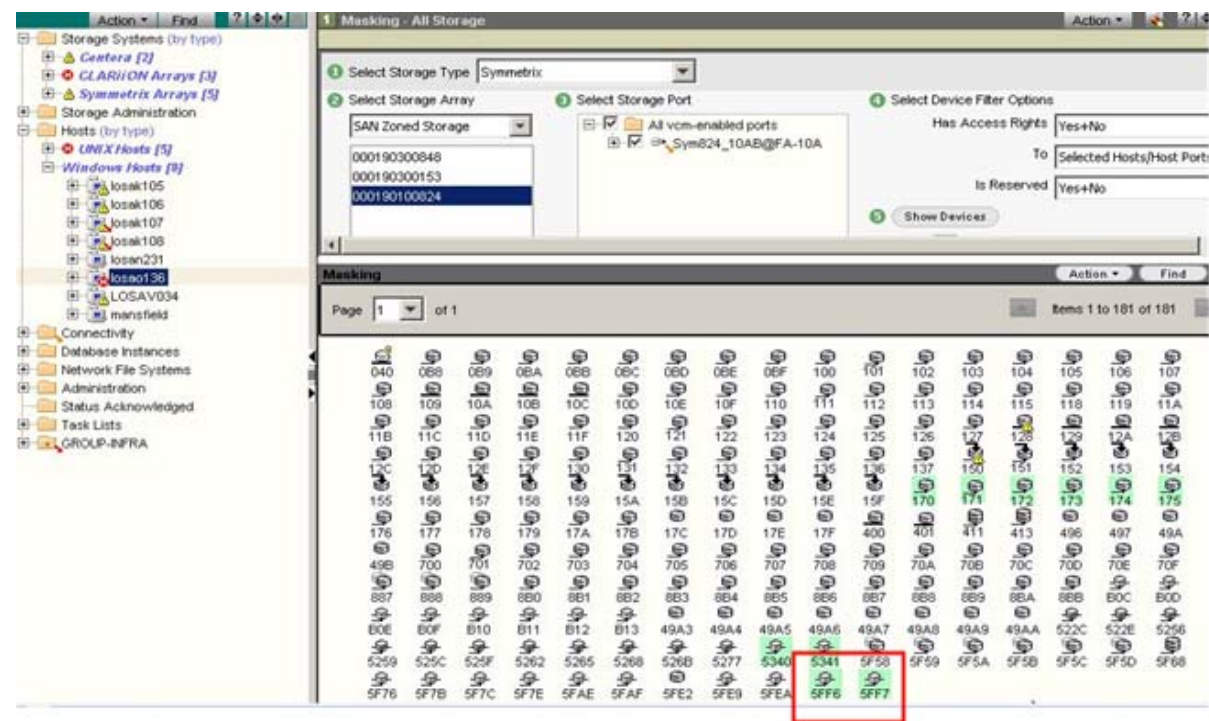


Figure 192 Mapped thin devices displayed in Masking View

Verifying masked thin devices

To verify masked thin devices:

1. Runs the symcli commands **symcfg discover** then **Syminq** and views the thin devices seen by the host.
2. From the host, navigates to **Disk Management** and views the new volumes.

Auto-provisioning groups

Auto-provisioning groups creates a group of devices (storage group), a group of director ports (port group), and a group of host initiators (initiator group) and associates them in a masking view. When the masking view is created, the devices

are automatically mapped and masked and accessible to the hosts. It provides an easier and faster way to provision storage in Symmetrix V-Max™ storage arrays running Enginuity 5874.

Mapping and masking thin devices using Auto-provisioning groups

To map and mask thin devices using Auto-provisioning groups, the System Administrator performs the following tasks:

1. From the Ionix ControlCenter Console tree selects and right-clicks the Symmetrix array that is running on Enginuity 5874.
2. Selects **Masking , Masking View Maintenance, Create Masking View (SMC)** and displays the **Masking View Management – Create** dialog screen ([Figure 193 on page 215](#) and [Figure 194 on page 216](#)).

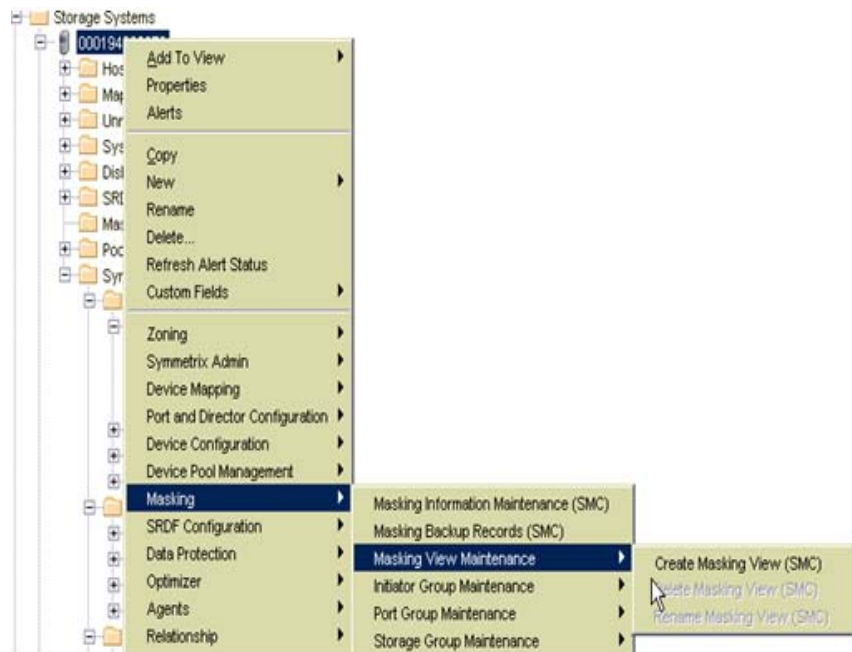


Figure 193 Navigating to the create masking view

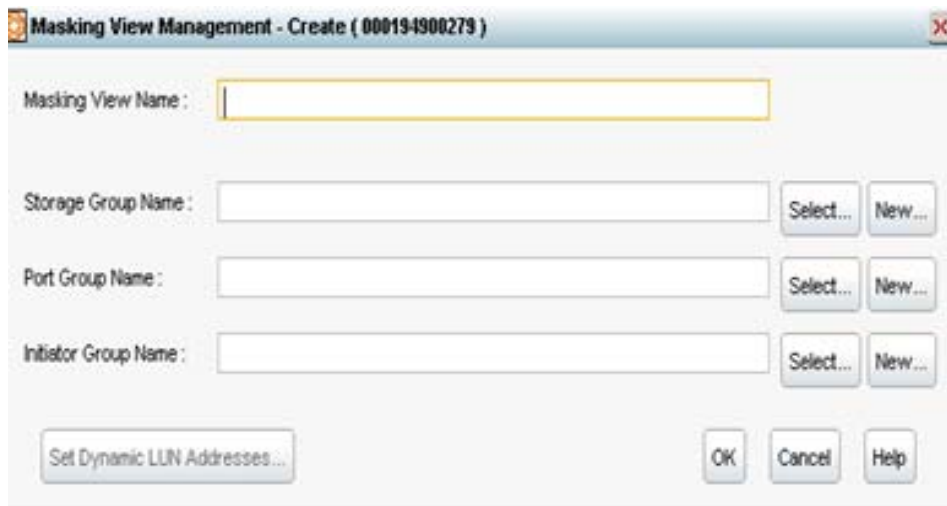


Figure 194 Masking View Management— Create dialog

3. Enters a **Masking View Name** and selects **New** for **Storage Group Name** or chooses **Select** and selects an existing storage group. The **Storage Group Management – Create** screen appears (Figure 195 on page 217).

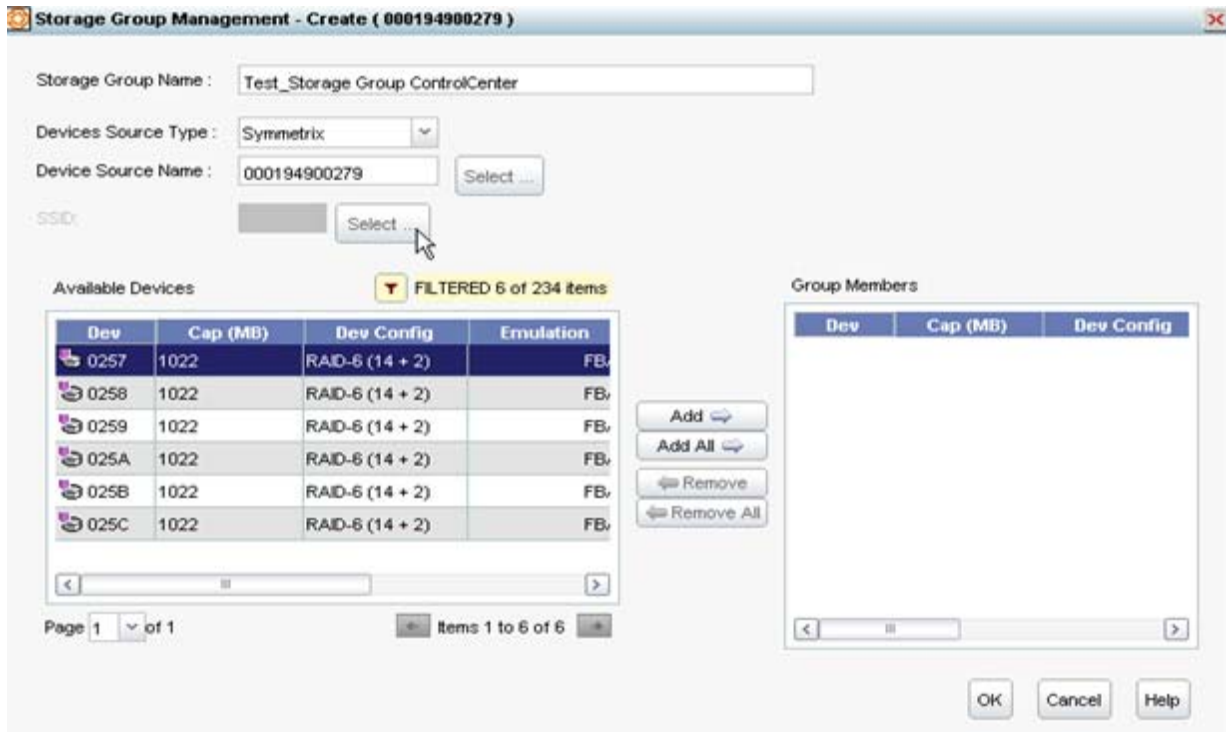


Figure 195 Storage Group Management -Create dilaog

4. Enters the following in the **Storage Group Management - Create** dialog:
 - Storage Group Name — Enters name for storage group
 - Devices Source Type — Symmetrix
 - Device Source Name — Enters the Symmetrix SID
5. Selects and highlights the desired thin devices from **Available Devices** table (**Filter** icon button can be used to reduce the number of devices).

6. Clicks **Add** to move the devices to the **Group Members** table (Figure 196 on page 218).

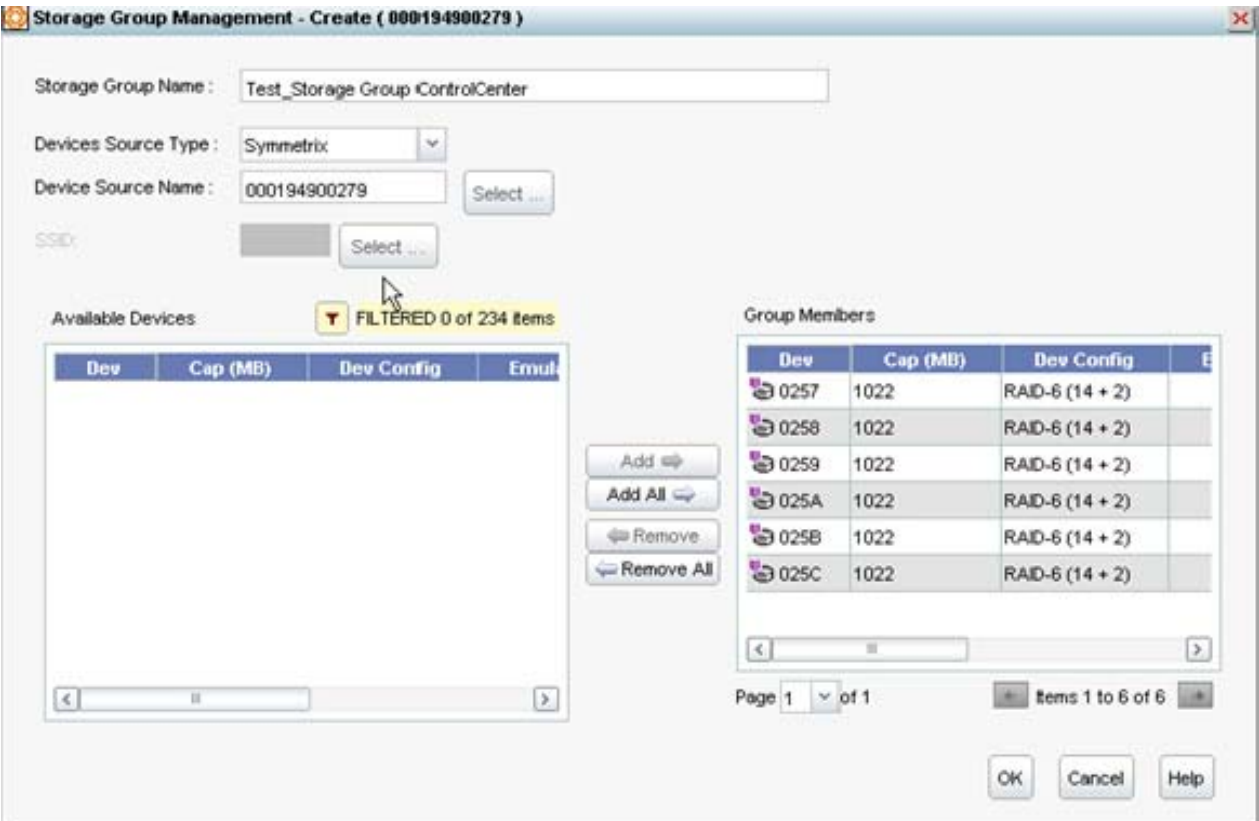


Figure 196 Storage Group Management -Create dilaog with thin devices moved to storage group

7. Clicks **OK** and the **Masking View Management – Create** screen displays with the **Storage Group Name** field filled in (Figure 197 on page 219).

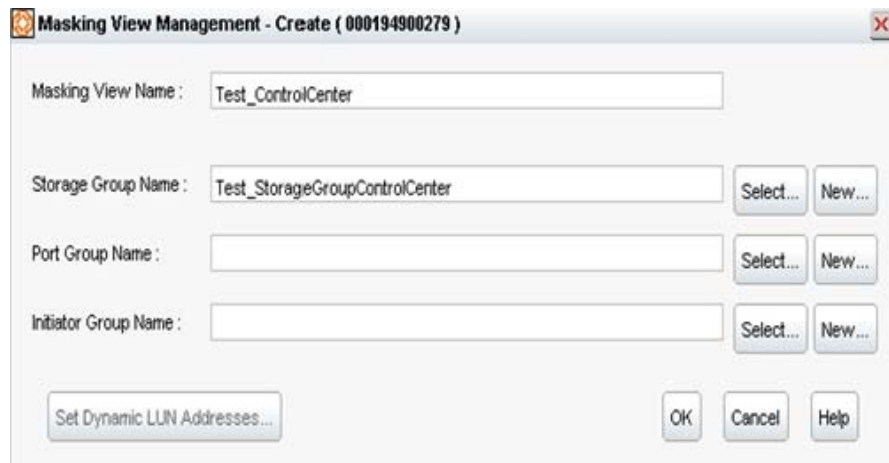


Figure 197 Masking View Management — Create dialog with storage group

8. Selects **New** for **Port Group Name** or chooses **Select** and selects an existing port group. The **Port Group Management – Create** screen appears (Figure 198 on page 220).

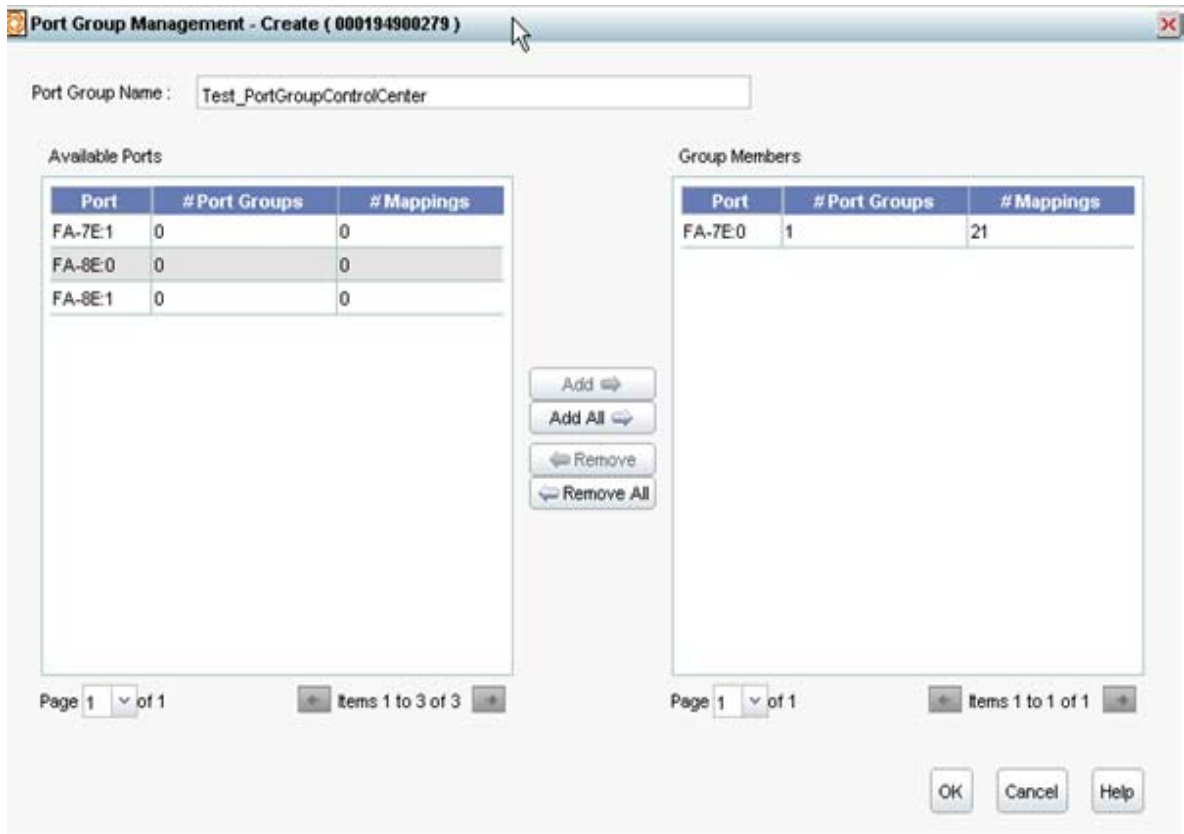


Figure 198 Port Group Management - Create dialog

9. Enters the **Port Group Name**.
10. Selects and highlights the desired storage ports from **Available Ports** table .
11. Clicks **Add** to move the devices to the **Group Members** table (Figure 198 on page 220).
12. Clicks **OK** and the **Masking View Management – Create** screen displays with the **Port Group Name** field filled in (Figure 199 on page 221).

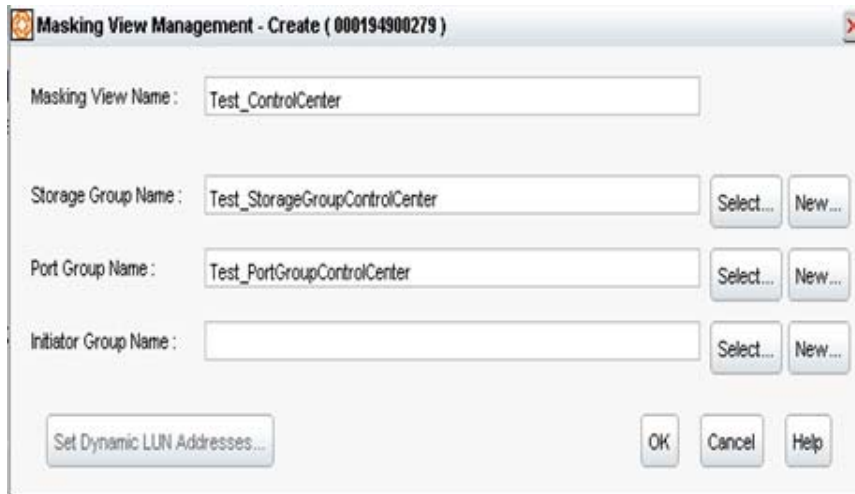


Figure 199 Masking View Management — Create dialog with port group

13. Selects **New** for **Initiator Group Name** or choose **Select** if it is an existing initiator group. The **Initiator Group Management – Create** screen appears (Figure 200 on page 222).

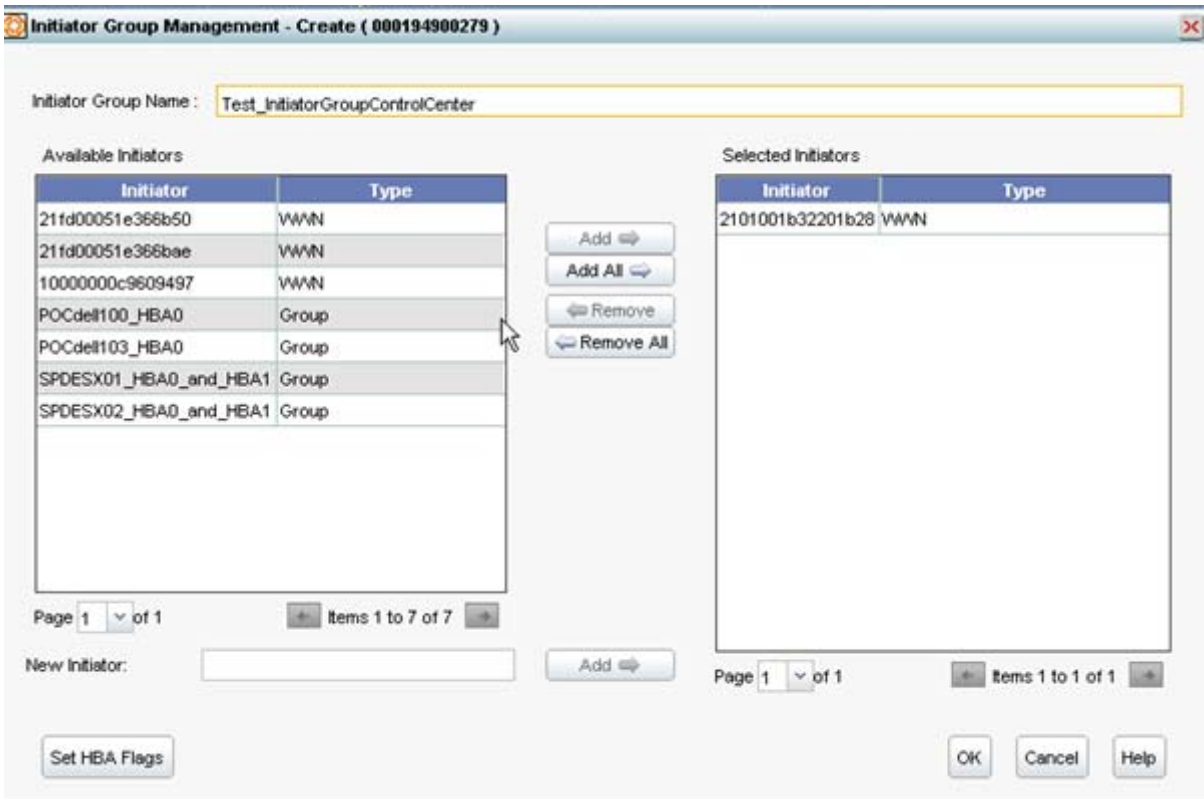


Figure 200 Initiator Group Management - Create dialog

14. Enters the **Initiator Group Name**.
15. Selects and highlights the desired initiators from **Available Initiators** table.
16. Clicks **Add** to move the initiators to the **Selected Initiators** table (Figure 200 on page 222).
17. Clicks **OK** and the **Masking View Management – Create** screen displays with the **Initiator Group Name** field filled in (Figure 201 on page 223).

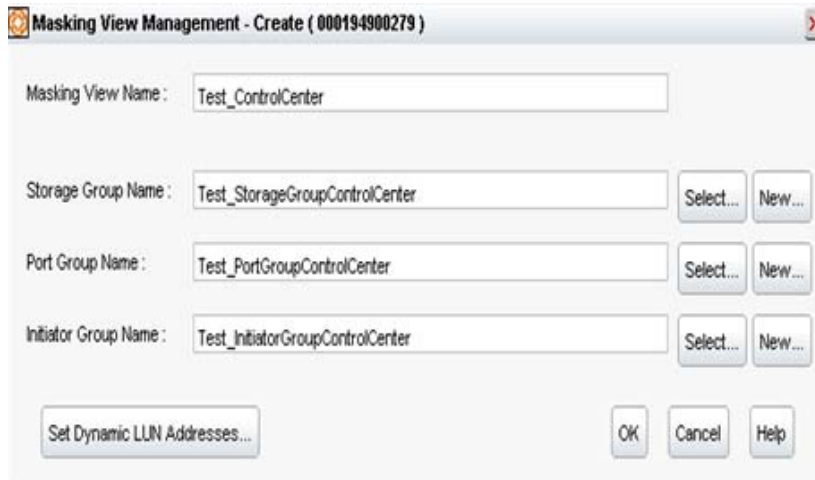


Figure 201 Masking View Management - Create dialog with initiator group

18. Clicks **OK** to create the masking view.

Verifying masking view creation

In SMC Console

1. From the menu selects **Properties**.
2. From tree view, expands the **Symmetrix Arrays** folder, selects the Symmetrix SID specified in the **Storage Group Management** dialog , expands **Symmetrix Masking**, **Masking Views** folders.
3. Selects the masking view **Test_ControlCenter** and the masking view displays under the **General** tab ([Figure 202 on page 224](#)).

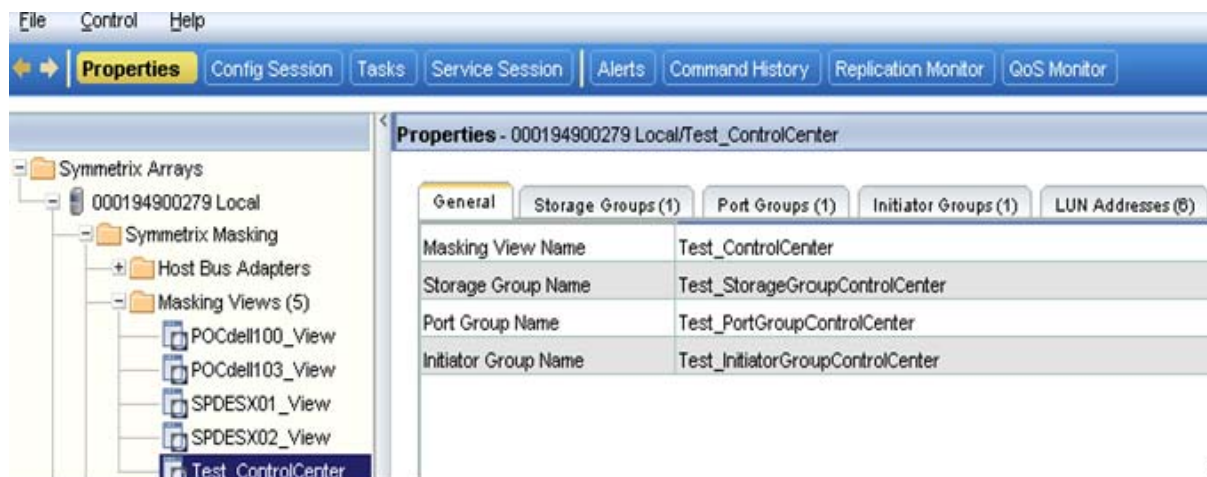


Figure 202 Masking view displayed in SMC Properties view

In Ionix ControlCenter Console

1. From the menu selects **Properties**.
2. From tree view, expands the **Symmetrix Arrays** folder, selects the Symmetrix SID specified in the **Storage Group Management** dialog box, expands **Symmetrix Masking**, **Masking Views** folders.
3. Selects and drags **Test_ControlCenter** into the **Properties** view and displays the masking view ([Figure 203 on page 225](#)).

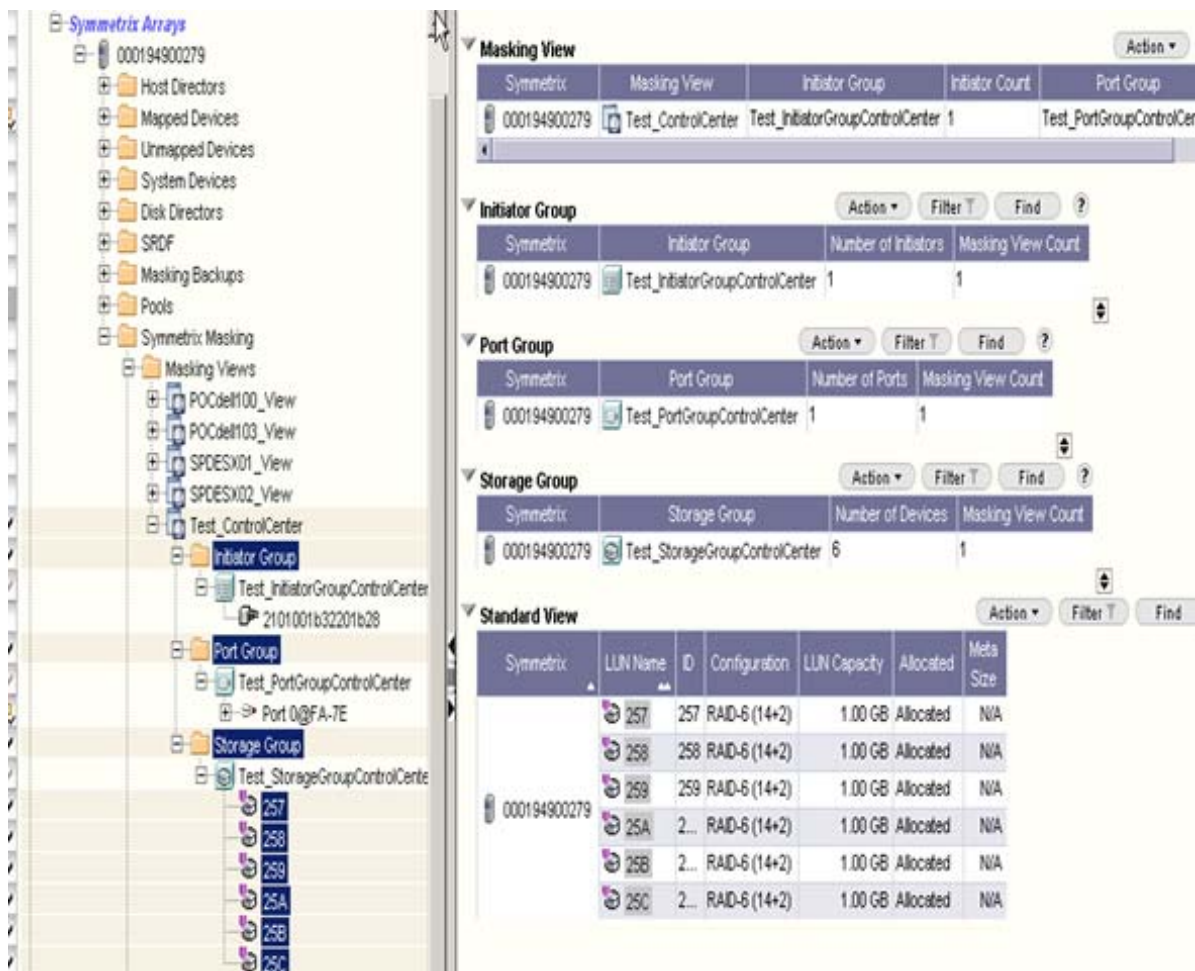


Figure 203 Masking View displayed in Ionix ControlCenter Properties view

Creating a thin file system on a Windows host

To create a thin file system on a Windows host the System Administrator performs the following tasks:

1. On the host, rescans the bus to present the new devices to the operating system.
2. Navigates to **Disk Management**, selects the new device and initializes it.

3. Creates a primary partition and assigns a drive letter.

Creating a thin file system on a Linux host

To create a thin file system on a Linux host the System Administrator performs the following tasks:

1. On the host, rescans the bus to discover the new thin devices.

Note: Currently QLogic and Emulex provide the FC HBA LUN Scan Utility to rescan all HBAs dynamically. The QLogic FC HBA LUN Scan Utility is available from the EMC-approved site on the QLogic website. The Emulex LUN Scan Utility is available from the EMC-approved site on the Emulex website.

2. Creates a new partition for the new physical volume (thin device) if necessary.
3. Creates a new file system using Logical Volume Manager:
 - a. Creates a new physical volume on the new partition.
 - b. Creates and activates a new volume group.
 - c. Creates a logical volume in the new volume group.
 - d. Creates a file system on the new logical volume.
4. Resizes the existing file system using the Logical Volume Manager:
 - a. Adds the physical volume to the existing volume group.
 - b. Extends the logical volume in the existing volume group.
 - c. Resizes the existing file system.
5. Creates the mount point for the new file system and mounts the new file system.
6. Updates `/etc/fstab` to add the new file system.

Note: For creating a thin file system on a host other than Window or Linux host refer to the *EMC Host Connectivity Guide*.

Observing the changing capacity of the thin file system

In Ionix ControlCenter Console

Selects and drags the host with the thin file system into the Properties View and observes the changing capacity of the thin file system in the Free, % Free and Available columns.

Monitoring Symmetrix thin pool utilization using Ionix ControlCenter alerts

This example demonstrates how a storage administrator uses Ionix ControlCenter alerts to monitor thin pool utilization and then take appropriate action to expand a thin pool.

1. Observes alerts displayed in the Console that % pool utilization on the Symmetrix has reached a warning level ([Figure 204 on page 227](#)).
2. Expands the thin pool as follows:
 - a. Uses the procedure [“Creating data devices from Ionix ControlCenter” on page 199](#) and adds more data devices to the pool.
 - b. Uses the procedures [“Creating and Binding thin devices to a pool” on page 204](#), , and [“Masking thin devices to host” on page 212](#) and adds more virtual storage to the pool.

Object Name	Message	Last Modified	Created	Agent	Category
w2k3-187-01 Symmetrix 004190102790, Pool thin_pool_01: Data Pool utilization is now 65 percent, Thu May 06 16:03:43 E...		Thu May 06 16:03:43 E...	Thu May 06 16:03:43 E...	Symmetrix	HealthGeneral
w2k3-187-01 Symmetrix 004190102790, Pool thin_pool_01: Data Pool utilization is now 75 percent, Thu May 06 16:04:03 E...		Thu May 06 16:04:03 E...	Thu May 06 16:04:03 E...	Symmetrix	HealthGeneral

Figure 204 Alerts showing data pool utilization at minor level (65%) and warning level (75%)

Reporting on virtual provisioned storage using StorageScope

These examples demonstrate how a storage administrator uses Ionix ControlCenter StorageScope to report thin pool utilization:

1. Logs in to Storage Scope as follows:

- a. Opens a web browser window and types the following URL:

`https://<StorageScope_host_name>:30002/srm`

where `<StorageScope_host_name>` is the name of the host where StorageScope is installed.

- b. Enters credentials in the StorageScope login screen and the StorageScope dashboard appears.

Displaying a thin pool configured on a Symmetrix (StorageScope SRM/Array View)

1. From the **StorageScope** menu, selects **Analysis, SRM View**.
2. From **SRM View** selects **Arrays** (Figure 205 on page 229).

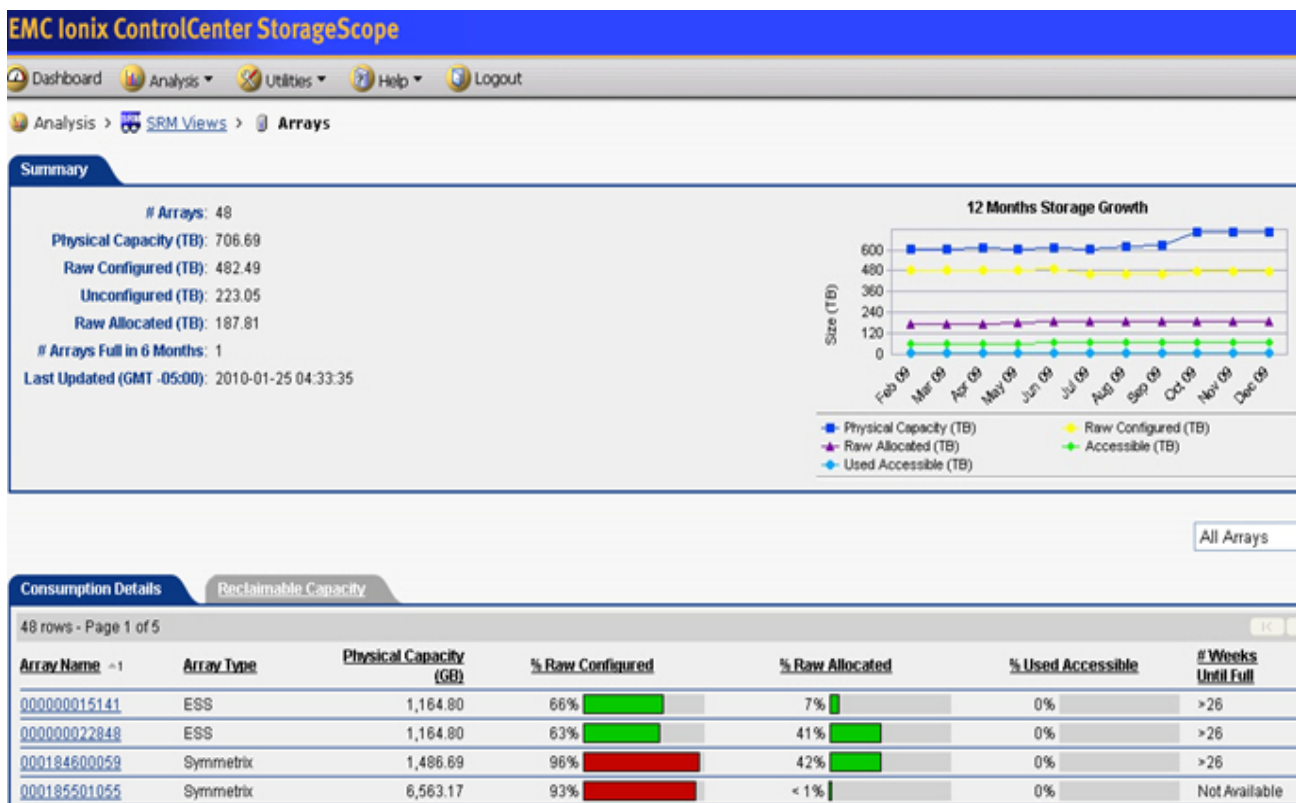
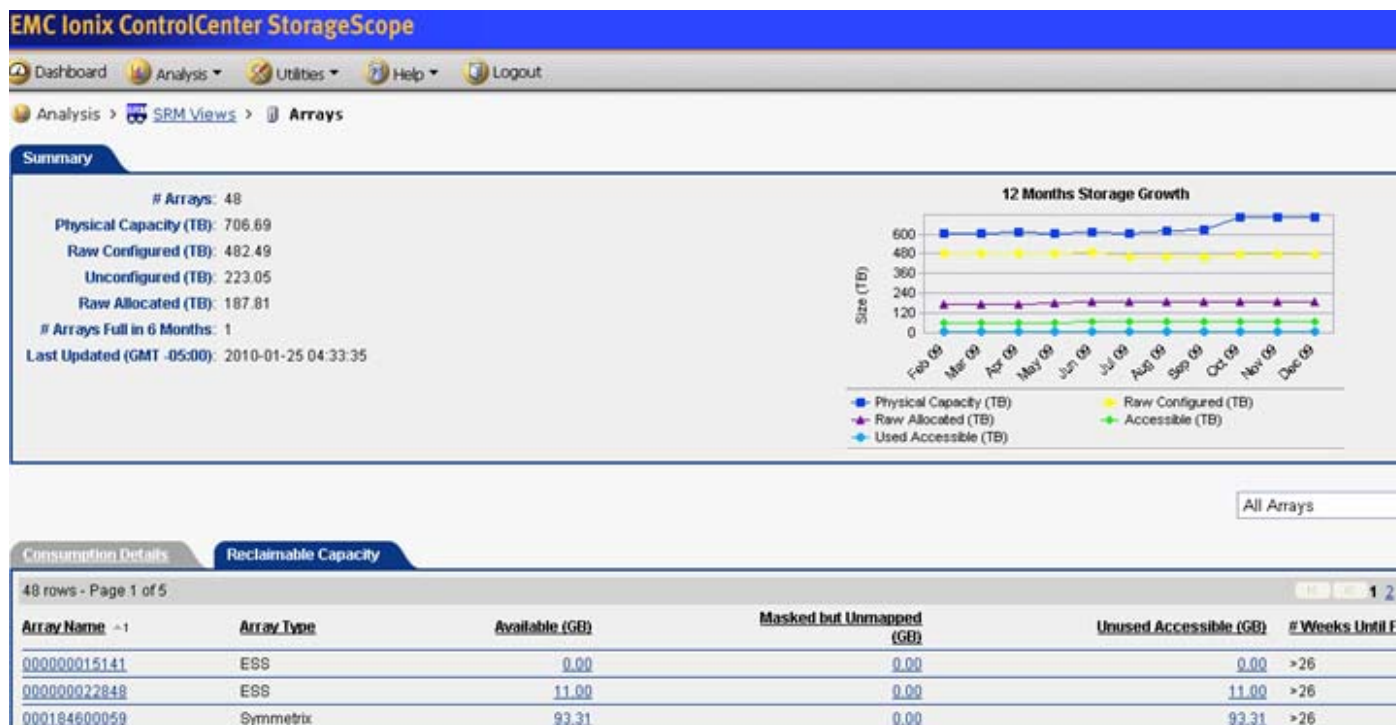


Figure 205 StorageScope SRM/All Arrays/Summary and Consumption Details view

- From the drop-down list, selects **All Arrays**.
- Observes the capacity **Summary** at the top.
- Observes the **Consumption Details** for each array.
- Clicks the **Reclaimable Capacity** tab and observes the **Unused Accessible** column (Figure 206 on page 229).

**Figure 206** StorageScope SRM/all Arrays/Reclaimable Capacity view

- Locates and selects the desired array from the array name column and displays the array summary and details (Figure 207 on page 230).

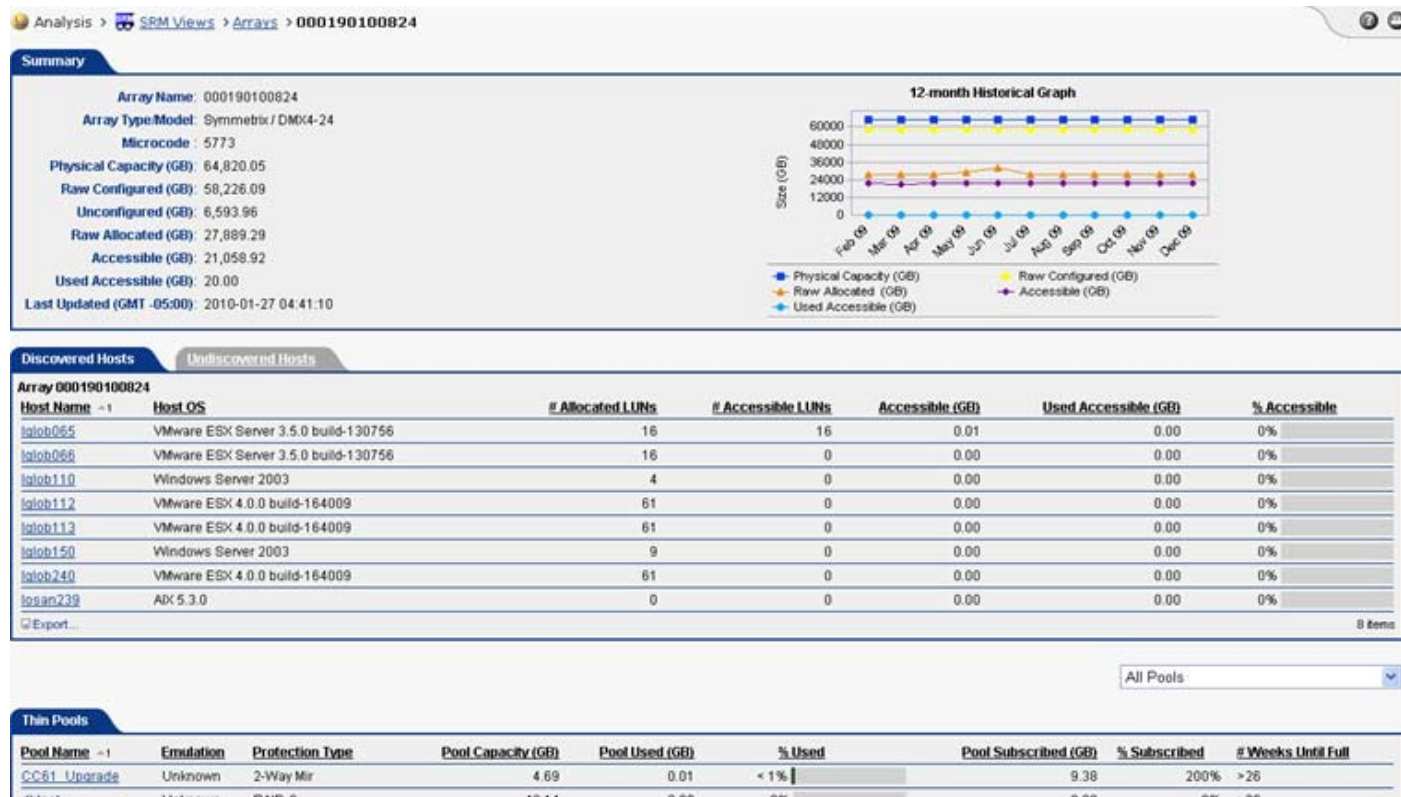


Figure 207 StorageScope SRM/Array Summary and details view

- From the drop-down list, selects **All Pools**.
- Locates and selects the desired thin pool from the **Thin Pool** tab and displays the thin pool summary and details (Figure 208 on page 231)

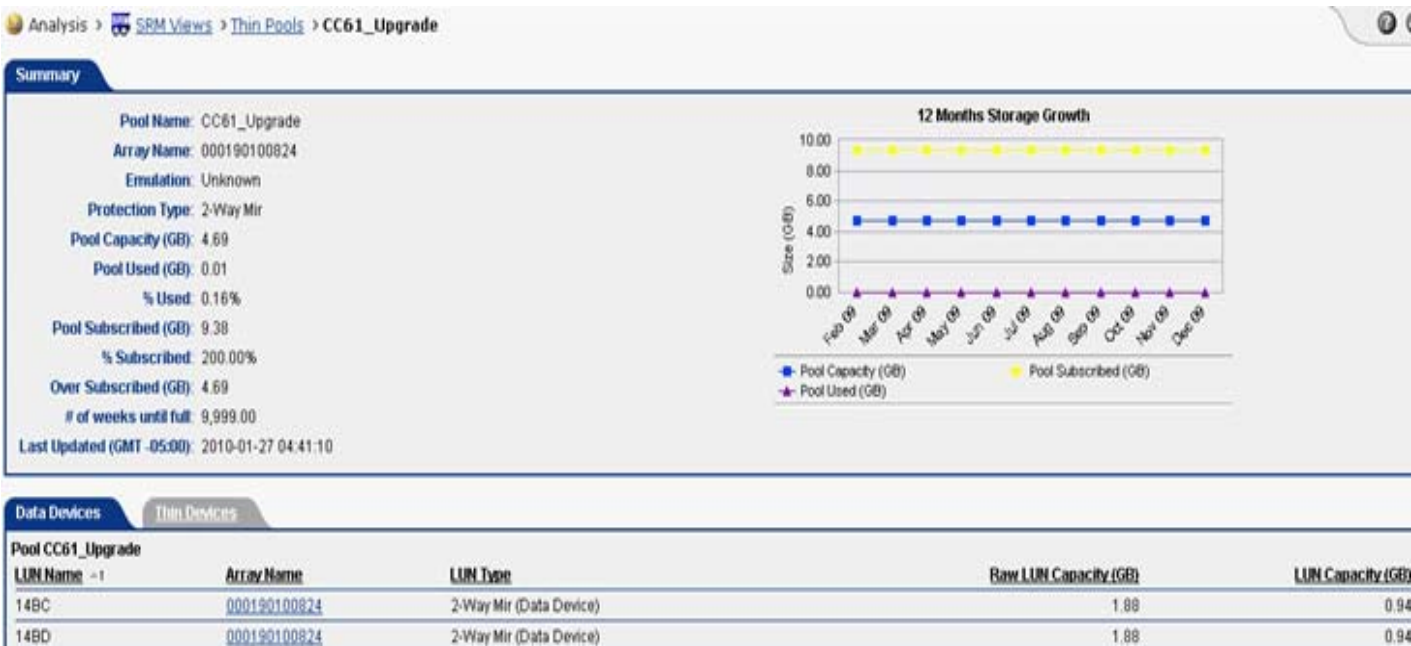


Figure 208 StorageScope SRM/Array/Thin Pools Summary and details view

10. Observes the thin devices allocated to the pool and their utilization.

Displaying thin pools (StorageScope SRM/Thin Pools View)

1. From the **StorageScope** menu, selects **Analysis > SRM View**.

2. From **SRM View** selects **Thin Pools** (Figure 209 on page 232).

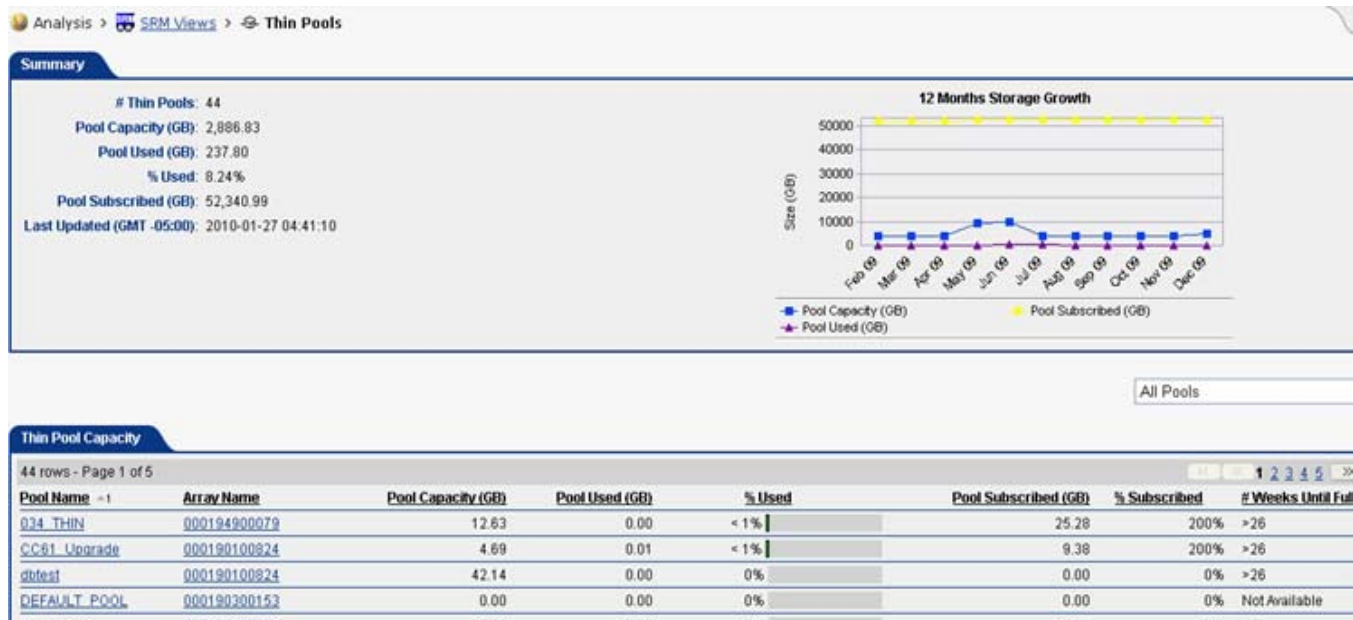


Figure 209 StorageScope SRM/all Thin Pools Summary and details view

3. From drop-down list, select **All Pools**, and observes all the known thin pools.
4. Clicks the **Array Name** column header and sorts the thin pools by array name.

- Locates and selects the desired thin pool (Figure 210 on page 233).

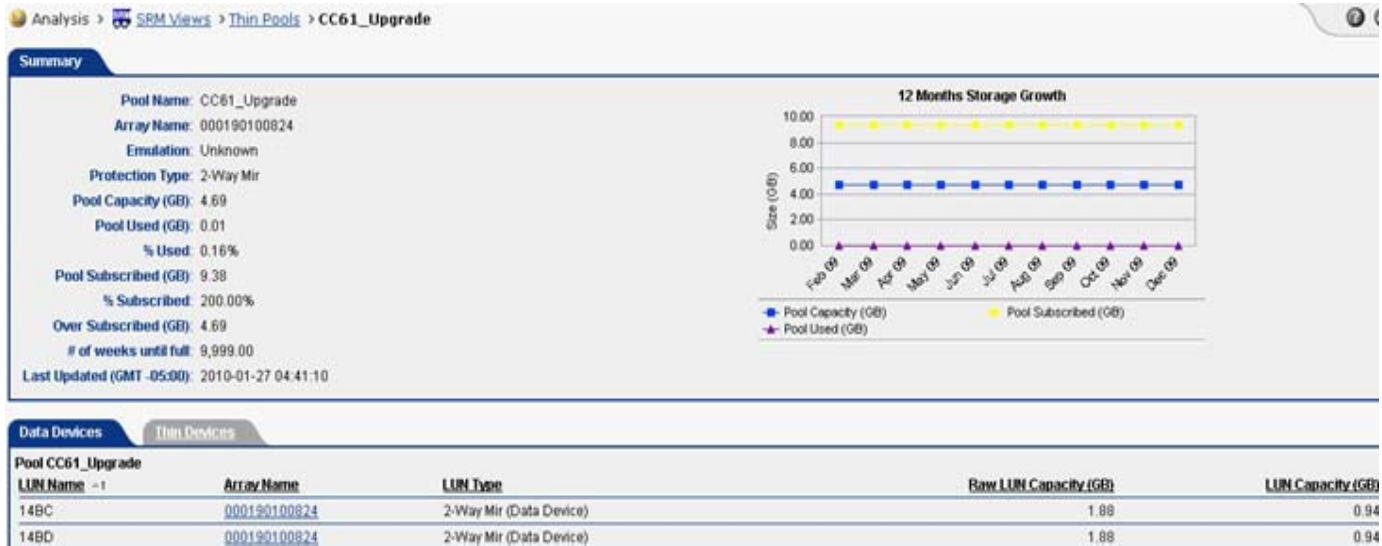


Figure 210 StorageScope SRM/Thin Pool Summary and details view

- From the **Summary**, observes the **Pool Capacity**, **Pool Used**, and **%Used**.
- Uses the procedure “[Verifying thin device creation](#)” on page 205 and verifies this data is consistent with the data displayed in the thin pool Properties View from the Ionix ControlCenter Console.

The **Pool Subscribed** displays the virtual provisioned pool capacity. It is also displayed in the Ionix ControlCenter console **Properties** view of the thin pool as **Total Capacity Allocated**.

The **%Subscribed** displays the subscription rate which is calculated from the **Pool Subscribed** divided by the **Pool Capacity**.

Using StorageScope to identify thin pools requiring additional storage

Alerts from the Ionix ControlCenter Console are generated for thin pools that have reached 50% used.

- From the **StorageScope** menu, selects **Analysis, SRM View**.
- From **SRM View** selects **Thin Pools** (Figure 211 on page 234).

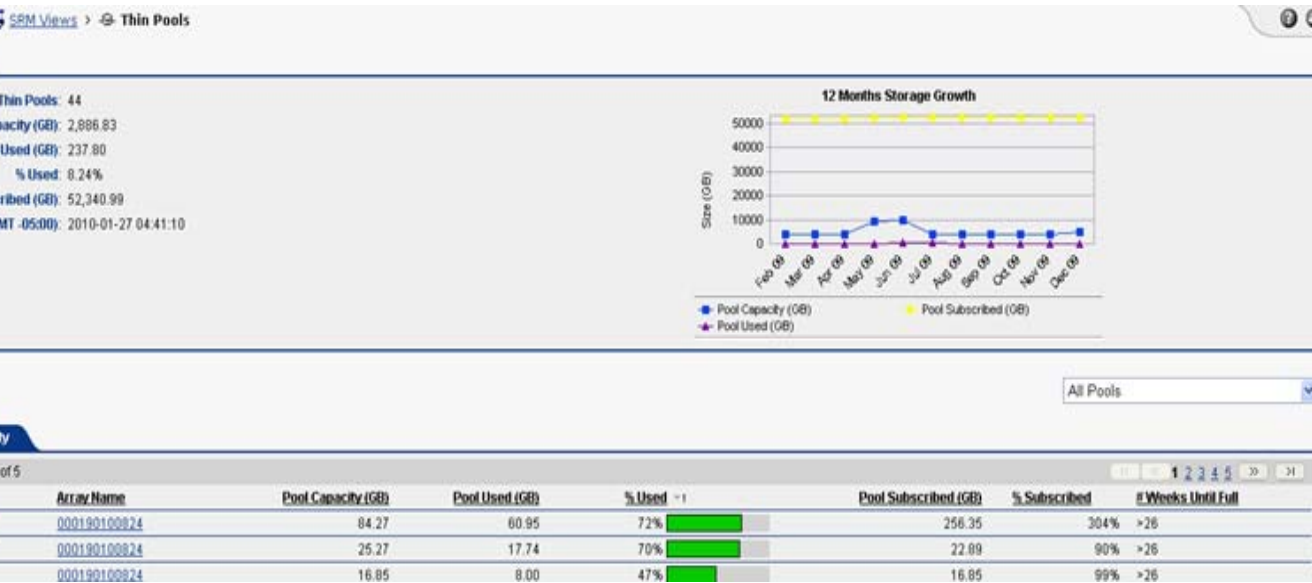


Figure 211 StorageScope SRM/all Thin Pools Summary and details view

3. From the drop-down list, select **All Pools**.
4. Selects the **%Used** column header and sorts the thin pools in descending order.
5. Locates and notes the pools that are *greater than* 50% used and considers these for additional storage.
6. Selects **%Subscribed** column header and sorts the thin pools in descending order.
7. Observes if any pools are *greater than* 100% subscribed and considers these for additional storage.

Expanding thin pools

To expand thin pools:

1. Uses the procedure [“Creating data devices from Ionix ControlCenter”](#) on page 199 and adds more data devices to the pool.

2. Uses the procedures “Creating and Binding thin devices to a pool” on page 204, “Mapping thin devices to host” on page 209, and “Masking thin devices to host” on page 212 and adds more virtual storage to the pool.
3. From **Utilities > Settings > ETL Scheduler**, runs the StorageScope Extraction, Translation, and Load (ETL) process (Figure 212 on page 235 and Figure 213 on page 235).

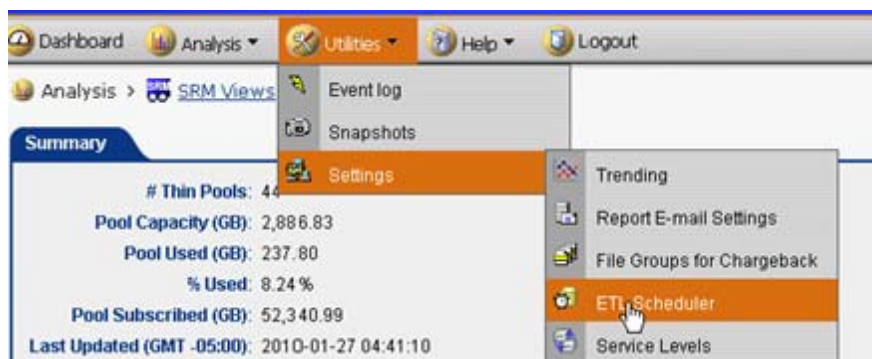


Figure 212 StorageScope navigation to ETL Scheduler

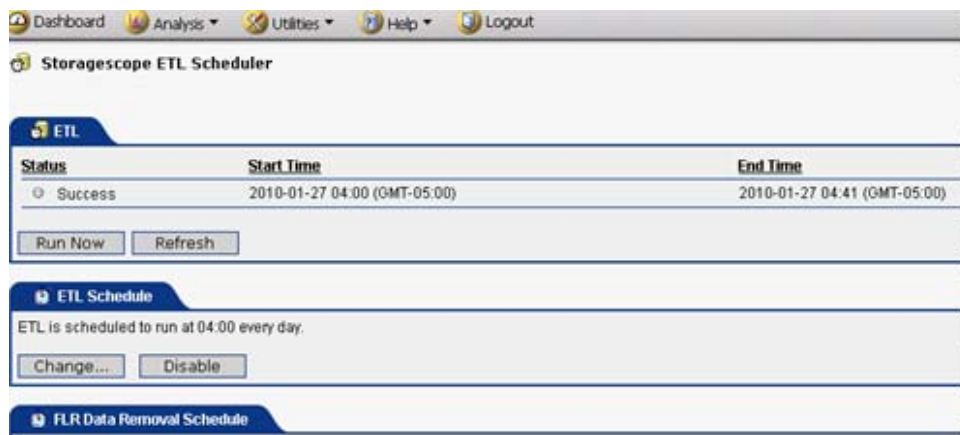


Figure 213 StorageScope ETL Scheduler successful run

Verifying additional storage added to pools

To verify added storage to pools:

1. After the ETL scheduler is run, select **Analysis > SRM View** from the **StorageScope** menu.
2. From **SRM View** select **Thin Pools**.
3. Review the **%Subscribed** and **%Used** for the thin pools and verify that values reflect the expanded pools.

For example, if a 300 GB thin pool has 100 GB of thin devices allocated to each of the four hosts and each of the four hosts is using 50 GB of storage on the thin devices, then the thin pool is 67 percent used ($4 \times 50 / 300$) and 133 % Subscribed or ($4 \times 100 / 300$) 33 % OverSubscribed. After allocating an additional 200 GB of storage to the pool (500 GB total) and running ETL, the SRM views now should indicate the pool is 40 percent used ($4 \times 50 / 500$) and 80 percent Subscribed ($4 \times 100 / 500$).

Using built-in reports to report Virtual Provisioning

Enterprise report

To run an Enterprise report:

1. From the **StorageScope** menu, selects **Analysis, Reports, Built-in/Custom Reports** and displays the 12 built-in reports (Figure 214 on page 237).

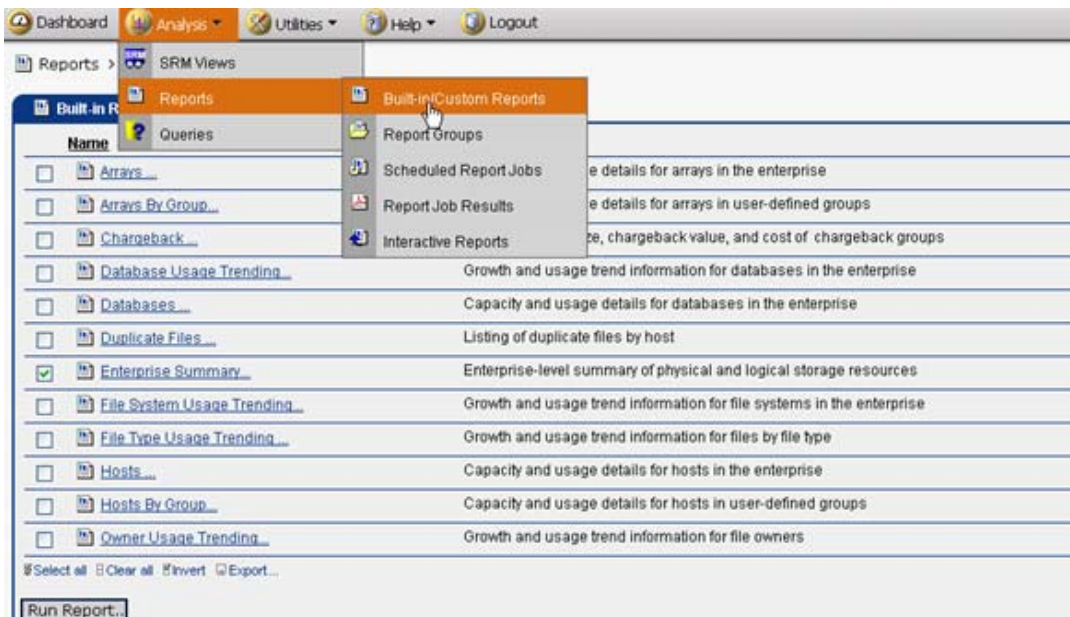


Figure 214 StorageScope built-in reports

2. Selects the **Enterprise Summary** report and clicks **Run Report** and displays **Enterprise Summary** (Figure 214 on page 237).

Filters

Array Names:

- 000190100824
- 000190101876
- 000190102117
- 000190300153
- 000190300172

Array Type:

- Clarion
- DS
- ESS
- HDS
- HPXP

Host Names:

- cc-agent-1 .201
- CC-Agent-1 Server (Win2k3) .173
- CC-Agent-2 Server (Win2k3) .174
- cc-infra-fqdn .184
- CC52+ Infra allin1 .182

Host OS:

- AIX 5.3.0
- HP-UX B.11.11
- HP-UX B.11.31
- Linux
- Linux 2.6.18

[Get Values](#)

☐ Remember these filters

[Restore all values](#) to their default values

[Run Now](#) [Cancel](#) [Reset](#)

Figure 215 StorageScope Enterprise Summary

3. Clicks **Run Now**. When Interactive Reports screen displays, checks the **Status** column and waits for a **Completed** status.

Interactive Reports				
151 rows - Page 5 of 8				
Job -2	Report Name -1	Format	Status	Last Successful Run Time
<input type="checkbox"/> Enterprise Summary13	Enterprise Summary	Portable document format (PDF)	Completed	2009-03-03 06:04:47
<input type="checkbox"/> Enterprise Summary14	Enterprise Summary	Portable document format (PDF)	Completed	2009-03-16 14:55:22
<input type="checkbox"/> Enterprise Summary15	Enterprise Summary	Portable document format (PDF)	Completed	2009-11-30 08:48:15
<input type="checkbox"/> Enterprise Summary16	Enterprise Summary	Portable document format (PDF)	Completed	2009-07-23 15:37:27
<input type="checkbox"/> Enterprise Summary17	Enterprise Summary	Portable document format (PDF)	Completed	2009-07-23 15:42:55
<input type="checkbox"/> Enterprise Summary18	Enterprise Summary	Portable document format (PDF)	Completed	2009-08-12 17:02:17
<input type="checkbox"/> Enterprise Summary19	Enterprise Summary	Portable document format (PDF)	Completed	2009-09-11 10:11:41
<input type="checkbox"/> Enterprise Summary20	Enterprise Summary	Portable document format (PDF)	Completed	2009-10-21 09:54:37
<input type="checkbox"/> Enterprise Summary21	Enterprise Summary	Portable document format (PDF)	Completed	2009-11-12 09:45:27
<input checked="" type="checkbox"/> Enterprise Summary22	Enterprise Summary	Portable document format (PDF)	Completed	2010-01-29 23:30:28
<input type="checkbox"/> File System Usage Trending10	File System Usage Trending	Portable document format (PDF)	Completed	2009-06-11 14:21:21
<input type="checkbox"/> File System Usage Trending11	File System Usage Trending	Portable document format (PDF)	Completed	2009-07-23 15:42:58
<input type="checkbox"/> File System Usage Trending12	File System Usage Trending	Portable document format (PDF)	Completed	2009-09-11 10:12:01
<input type="checkbox"/> File System Usage Trending13	File System Usage Trending	Portable document format (PDF)	Completed	2009-09-18 09:20:31
<input type="checkbox"/> File System Usage Trending14	File System Usage Trending	Portable document format (PDF)	Completed	2009-09-18 09:26:18
<input type="checkbox"/> File System Usage Trending15	File System Usage Trending	Portable document format (PDF)	Completed	2009-11-23 18:20:12
<input type="checkbox"/> File System Usage Trending16	File System Usage Trending	Portable document format (PDF)	Completed	2009-11-30 14:21:03
<input type="checkbox"/> File System Usage Trending3	File System Usage Trending	Portable document format (PDF)	Completed	2009-01-23 01:13:38
<input type="checkbox"/> File System Usage Trending4	File System Usage Trending	Portable document format (PDF)	Completed	2009-02-03 14:07:25
<input type="checkbox"/> File System Usage Trending5	File System Usage Trending	Portable document format (PDF)	Completed	2009-02-03 14:27:19

Select all on this page | Clear all | Invert | Export...

Stop Delete View...

Figure 216 StorageScope Enterprise Summary report complete

4. Selects desired Enterprise Summary report and clicks **View** to review the report.

Array reports

To run a report for arrays:

1. From **Built-in/Customer Reports**, selects **Arrays** and runs the report.
2. When report is completed, selects the report, clicks **View** and opens **Arrays** report.

3. From the **Array Report, Details for All Arrays, All Arrays** table reviews thin pool aggregate data (Figure 217 on page 240).

Details For All Arrays

All Arrays			
Total # Arrays: 48			
Physical Capacity (TB):	706.69	# Ports:	883
Raw Configured (TB):	482.49	# LUNs:	133,097
Raw Allocated (TB):	187.81	# Primary LUNs:	99,744
Accessible (TB):	67.76	# Local Replica LUNs:	10,615
Used Accessible (TB):	8.57	# Remote Replica LUNs:	5,985
System Resource Capacity (GB):	5,654.49		
Thin Pool Capacity (TB):	2.82	Thin Pool Subscribed (TB):	51.11
Thin Pool Used (TB):	0.23		

Figure 217 StorageScope All Arrays report displaying aggregate thin pool data for all arrays

4. Using the **Find** box in Adobe Reader, searches for the desired array serial number and reviews the thin pool data (Figure 218 on page 240).

Details For Array

Array			
Array S/N:	000190100824	Array Name:	000190100824
Array Type:	Symmetrix		
Physical Capacity (GB):	64,820.05	# Hosts Accessing Arrays:	8
Raw Configured (GB):	58,226.09	# Ports:	50
Raw Allocated (GB):	27,889.29	# LUNs:	31,476
Accessible (GB):	21,058.92	# Primary LUNs:	20,952
Used Accessible (GB):	20.00	# Local Replica LUNs:	387
System Resource Capacity (GB):	349.13	# Remote Replica LUNs:	68
Thin Pool Capacity (GB):	594.97	Thin Pool Subscribed (GB):	1,316.97
Thin Pool Used (GB):	162.97		

Figure 218 StorageScope Array Report Displaying Thin Pool Data

Host reports

To run a report for hosts:

1. From **Built-in/Custom Reports**, select **Hosts** and runs the report.
2. When report is completed, select the report, clicks **View** and opens the **Hosts Report**.
3. From the **Hosts Report, Details for All Hosts**, **All Hosts** table reviews thin pool aggregate data ([Figure 219 on page 241](#)).

Details For All Hosts

All Hosts			
Total # Physical Hosts:	11	# ESX Servers:	0
Accessible (TB):	0.31	# Aged Files:	0
Accessible - Physical (TB):	0.01	Aged Files (GB):	0.00
Accessible - Thin Devices (TB):	0.27	# Dormant Files:	0
Used Accessible (TB):	0.08	Dormant Files (GB):	0.00
Internal/JBOD (TB):	0.54	# Aged and Dormant Files:	0
# Volume Groups:	7	Aged and Dormant Files (GB):	0.00
Volume Group (GB):	472.57	# Temporary Files:	0
Used Volume Group (GB):	303.91	Temporary Files (GB):	0.00
# File Systems (excl VMFS):	22	# Databases:	0
File System (excl VMFS) (GB):	419.83	Database (GB):	0.00
Used File System (excl VMFS) (GB):	116.51	Used Database (GB):	0.00
# Media Files:	0	# Folders/Directories:	0
Media Files (GB):	0.00	Folder/Directory (GB):	0.00
		# Files:	0

Figure 219 StorageScope All Hosts Report displaying aggregate thin pool data for all hosts

4. Using the **Find** box in Adobe Reader, searches for the desired host name and reviews the thin pool data (Figure 220 on page 242).

Details For Host

Host			
Host Name:	losao136	Host OS:	Windows 2000
Accessible (GB):	51.69	# Aged Files:	0
Accessible - Physical (GB):	0.10	Aged Files (GB):	0.00
Accessible - Thin Devices (GB):	35.59	# Dormant Files:	0
Used Accessible (GB):	4.99	Dormant Files (GB):	0.00
Internal JBOD (GB):	33.91	# Aged and Dormant Files:	0
# Volume Groups:	1	Aged and Dormant Files (GB):	0.00

Figure 220 StorageScope Host report displaying thin pool data

Using built-in queries to report Virtual Provisioning

Thin pools query

To report thin pools using queries:

1. From the StorageScope menu, selects **Analysis, Queries, Query Builder** and displays the built-in **Query Listing**.
2. Selects **Thin Pools**, clicks **Run** and displays the query result (Figure 221 on page 243).

Query Results

Query Name: Thin Pools

Run Time 2010-01-29 13:07 (GMT-05:00)

[View SQL](#)

44 rows - Page 1 of 1

Pools: Pool Name	Arrays: Array Name	Pools: Pool Emulation	Pools: Pool Device Protection	Pools: # Pool Devices	Pools: # Thin Devices	Pools: Pool Capacity (GB)	Pools: Pool Used (GB)	% Used	Pools: Thin Device Total(GB)	% Subscribed	Pools: Pool Over Subscribed (GB)
losao136	000190100824	Unknown	RAID-6	2	1	16.85	8.00	47.48	16.85	99.95	0.00
s824DemoPool	000190100824	Unknown	2-Way Mir	10	10	84.27	60.95	72.33	256.35	304.20	172.08
tp848tdev1	000190300848	Unknown	2-Way Mir	1	256	0.88	0.19	21.39	1,023.98	116,798.66	1,023.11
tp153ONEdd	000190300153	Unknown	RAID-6	12	36	202.30	0.20	0.10	606.87	299.99	404.58
vmDisk/VMDK	000190300153	Unknown	2-Way Mir	8	0	16.00	0.00	0.00	0.00	0.00	0.00
rd1153R1a	000190300153	Unknown	2-Way Mir	8	1	33.70	0.00	0.00	2.63	7.81	0.00

Figure 221 StorageScope Thin Pools query result showing all pools on all arrays

Thin Pools End-to-end Relationship query

From **Query Listing** selects **Thin Pools End-to-end Relationship**, clicks **Run** and displays the query result ([Figure 222 on page 243](#)).

Query Results

Query Name: Thin Pools End-to-end Relationship

Run Time 2010-02-04 14:23 (GMT-05:00)

[View SQL](#)

1 rows - Page 1 of 1

Hosts: Host Name	Hosts: Host OS	File Systems: File System Name	File Systems: File System (GB)	Host Devices: Host Device Name	Host Devices: Host Device Capacity (GB)	LUNs: LUN	LUNs: LUN Capacity (GB)	LUNs: Meta LUN Capacity (GB)	Pools: Pool Name	Pools: Pool Capacity (GB)	Arrays: Array Name	Arrays: Array Type
lglob110	Windows Server 2003	E:\	32.00	\\.\PHYSICALDRIVE11	32.00	358	32.00		DemoPool	8.00	000194900149-FAST	Symmetrix

Figure 222 StorageScope Thin Pools End-to-end Relationship query result showing all pools on all hosts

Note: The SAN must be discovered for this query data to be available

Thin Pools Thin Devices Chargeback query

From **Query Listing** selects **Thin Pools Thin Devices Chargeback Query**, clicks **Run** and displays the query result (Figure 223 on page 244).

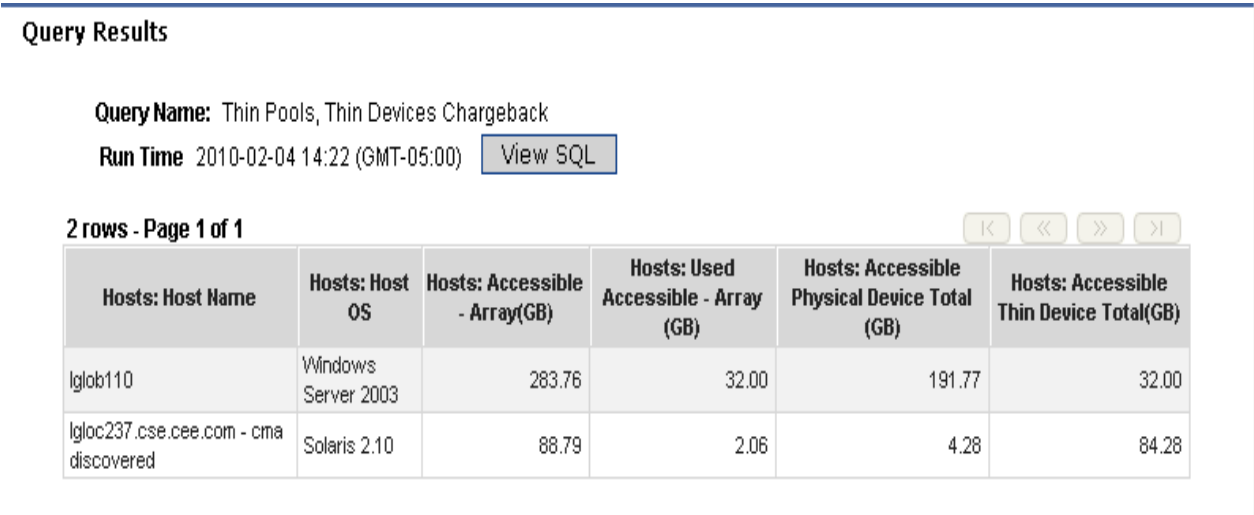


Figure 223 StorageScope Thin Pools Thin Devices Chargeback query result showing all hosts with thin pool access.

Note: This query displays usage details for all hosts with accessible devices from a thin pool, where the **Thin Device Accessible Total** for the specific host is greater than 0.

Additional reporting capabilities using user-defined fields

User-defined files can be added to many of the Managed Objects discovered by Ionix ControlCenter. The storage administrator can use user-defined fields using the StorageScope Query Builder as follows:

- ◆ Configuring User-defined fields/Groups for thin pools and thin devices.

- ◆ In the StorageScope Query Builder, creating a new query by selecting Create and using the Query Builder wizard.
- ◆ Retrieving previously configured user-defined fields/groups with Query Builder.

Creating a dashboard snapshot for thin pools

1. From the StorageScope menu, selects **Analysis, Queries, Query Builder** and displays the built-in **Query Listing**.
2. Selects **Thin Pools**, clicks **View SQL** and displays SQL window ([Figure 224 on page 245](#)).

```
SELECT DISTINCT
srmdynamicstoragepooldystpool.dystpoolname
dystpoolnamedystpool,
srmmarrayarray.arrayalias
arrayaliasarray,
srmdynamicstoragepooldystpool.dystpoolemulation
dystpoolemulationdystpool,
srmdynamicstoragepooldystpool.dystpoolprotection
dystpoolprotectiondystpool,
srmdystpoolmetricsdystpool.dystpooldevcount
dystpooldevcountdystpool,
srmdystpoolmetricsdystpool.dystpooldynamicdevcount
dystpooldynamicdevcountdystpo,
srmdystpoolmetricsdystpool.dystpoolconfigtotal/1048576
dystpoolconfigtotaldystpool,
srmdystpoolmetricsdystpool.dystpoolused/1048576
dystpooluseddystpool, (decode
(srmdystpoolmetricsdystpool.dystpoolconfigtotal,
0, to_number(null),
(srmdystpoolmetricsdystpool.dystpoolused/srmdystpoolmetricsdystp
*100%) CustomDefinedColumn0
```

Figure 224 StorageScope thin pools SQL view

3. Copies the text in the SQL window and closes the window.
4. From the **StorageScope** menu, selects **Utilities > Snapshots**.

5. From the **Snapshot** listing, clicks the **Custom Snapshots** tab, clicks **Create**, and displays the **Create Snapshot** window (Figure 225 on page 246).
6. Enters the following information:
 - Type — Table
 - Category — Hosts
 - Title — Thin Pools by Host
 - SQL query — pastes the text copied from the SQL window

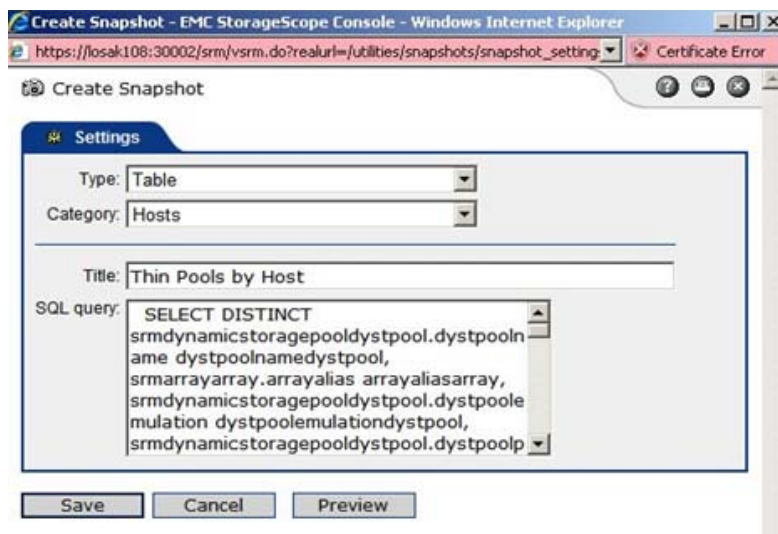


Figure 225 StorageScope Create Snapshot view

7. Clicks **Save**.

8. From the **StorageScope** menu, selects **Dashboard > Customize** and displays the **Customize Dashboard** view ([Figure 226 on page 247](#)).

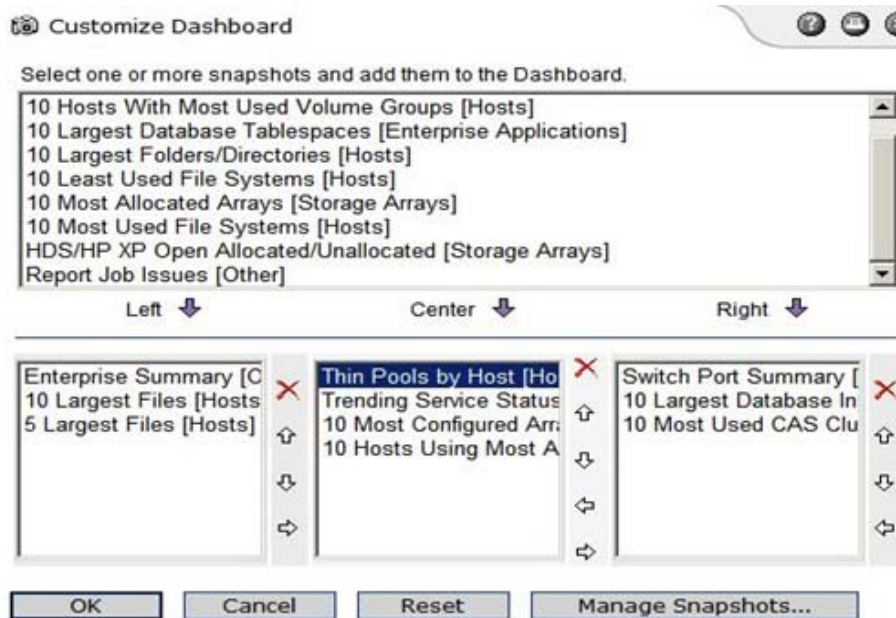


Figure 226 StorageScope Customize Dashboard view

9. Selects the custom snapshot from the available list of snapshots.
10. Assigns a position for the snapshot on the dashboard and clicks **OK**.
11. Verifies the custom snapshot by selecting **Dashboard** from the **StorageScope** menu and viewing the **Thin Pools by Host** snapshot.

Analyzing performance of virtually provisioned storage

These examples demonstrate how a storage administrator uses Ionix ControlCenter Performance Manager to analyze I/O and throughput performance statistics of virtually provisioned storage. Performance is monitored by viewing real-time performance data for a period of time or by viewing performance trends.

Identifying host connected to thin pool

To identify the host connected to the thin pool:

1. From the Ionix ControlCenter Relationship view, selects the desired thin pool and displays the host, host devices, thin pool, thin devices, data devices, and back-end physical disks ([Figure 227 on page 248](#)).

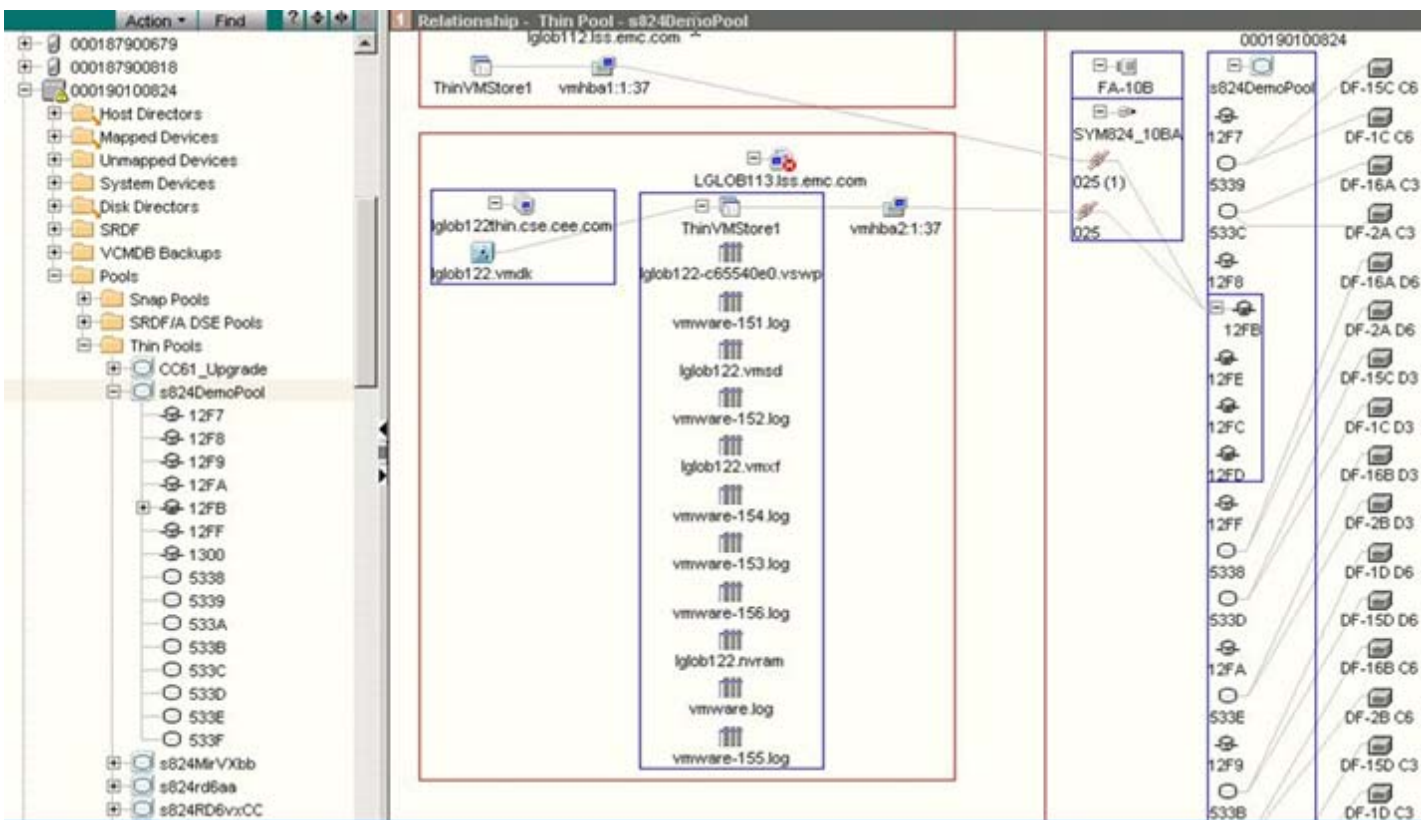


Figure 227 Ionix ControlCenter Relationship view displaying end-to-end relationship

2. Notes the host that is connected to the thin pool.
3. From the Ionix ControlCenter Console, selects **File > Launch > Performance Manager**.

4. Enters credentials in **Performance Manager** login screen and displays the **Data Selection** dialog ([Figure 228 on page 249](#)).

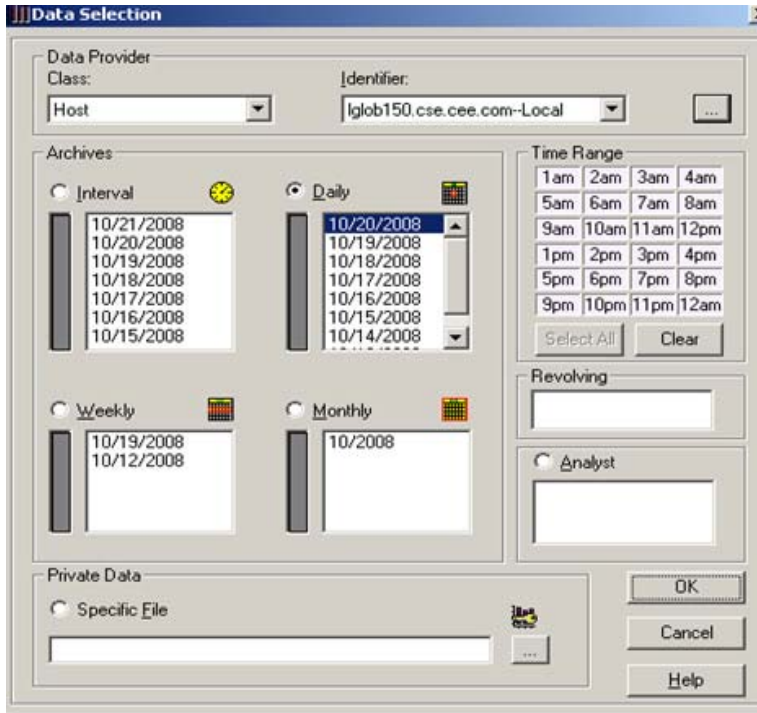


Figure 228 Performance Manager Data Selection view — host

Analyzing host I/O or throughput performance

To analyze host I/O or throughput:

1. In the **Class** field selects **Host**.
2. In the Identifier field, selects the hostname that was identified in [Figure 227 on page 248](#) as a host connected to the thin pool.
3. Selects a specific Interval: Daily, Weekly, or Monthly from **Archives**, **Revolving**, **Analyst**, or a specific file from **Private Data** and clicks **OK** and displays the Performance Manager console ([Figure 229 on page 250](#)).

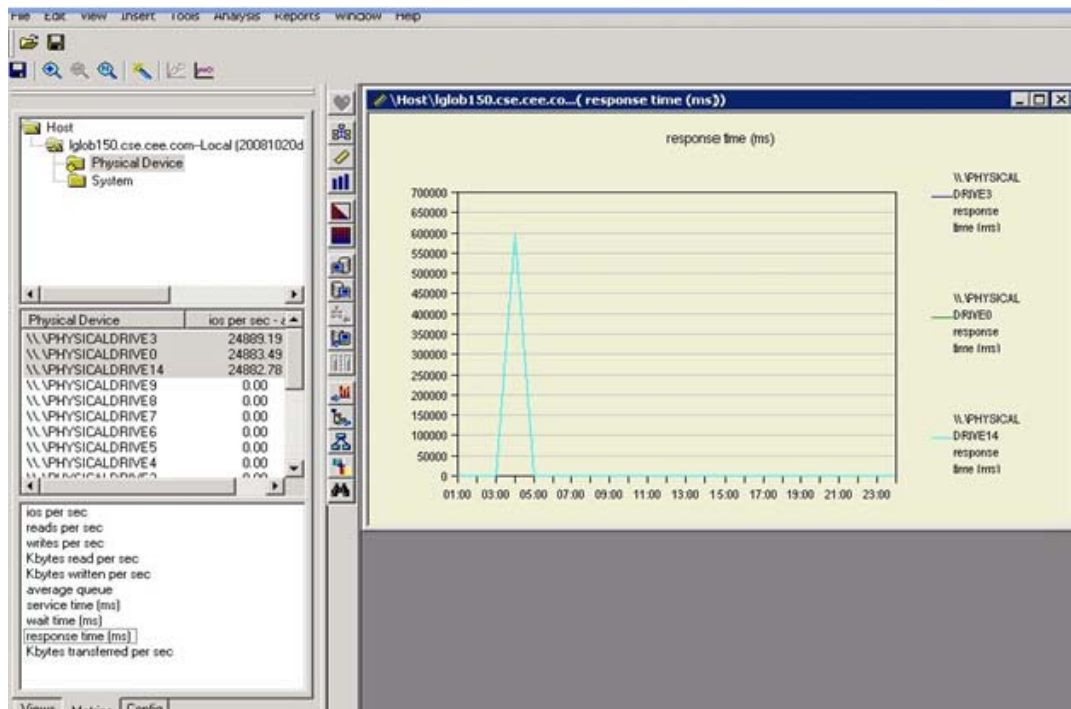


Figure 229 Performance Manager console displaying host physical drives

4. Selects **Metrics** in the bottom pane.
5. Selects **Physical Device** from **Host** tree view in the top pane.
6. Selects the physical devices from the middle pane
7. Selects the desired metric from the bottom pane and displays the metric for the physical devices.
8. Observes metric for the host physical drives (Figure 229 on page 250).

Analyzing Symmetrix array I/O and throughput performance

To analyze array I/O or throughput:

1. From Performance Manager console, selects **File > Open** and displays the **Data Selection** dialog box (Figure 231 on page 252).

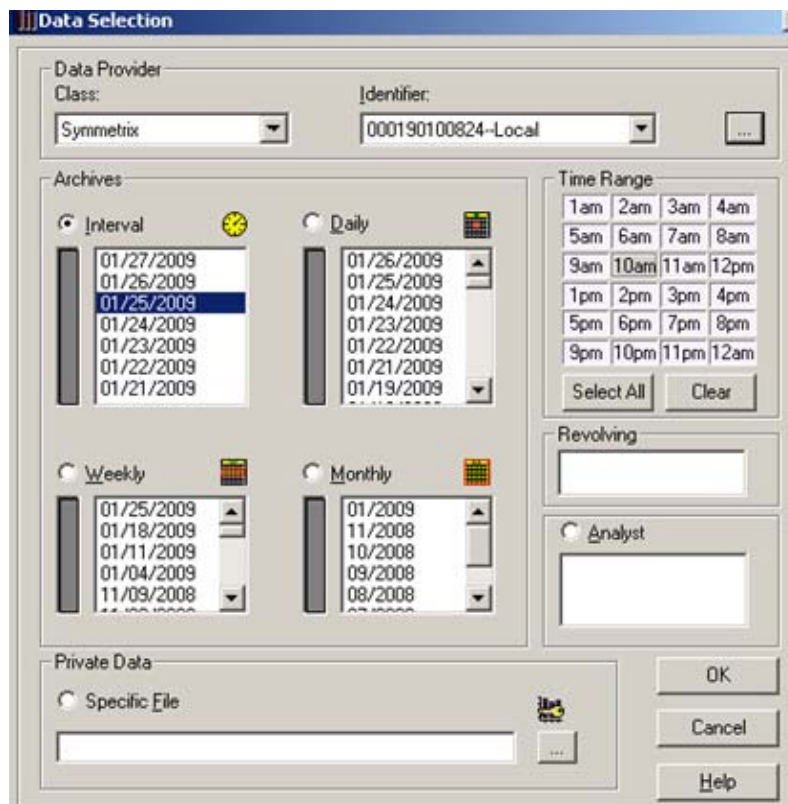


Figure 230 Performance Manager Data Selection view - Symmetrix

2. In the **Class** field, selects **Symmetrix**.
3. In the **Identifier** field, selects the Symmetrix serial number for an array with connected thin pools.
4. Selects a specific Interval: Daily, Weekly, or Monthly from **Archive**, **Revolving**, **Analyst**, or a specific file from **Private Data** and clicks **OK** and displays the selected data in the Performance Manager console (Figure 231 on page 252).

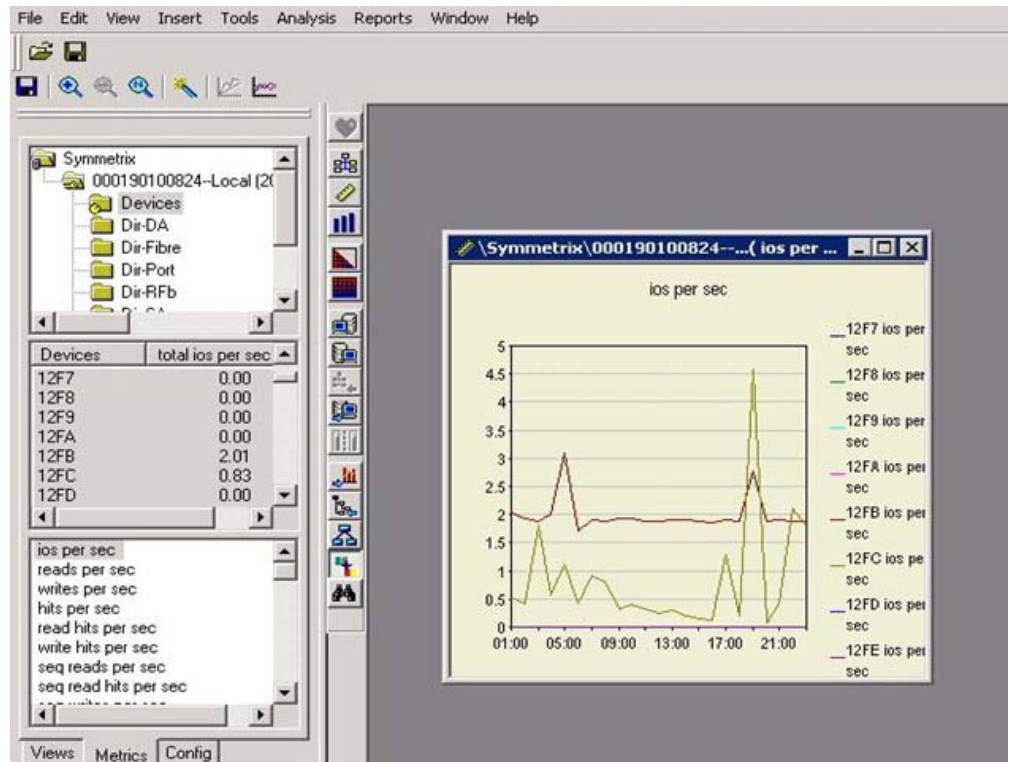


Figure 231 Performance Manager console displaying selected thin device data

Thin devices

To display thin device performance metrics:

1. Selects **Metrics** in the bottom pane.
2. Selects **Devices** from **Symmetrix** tree view in the top pane.
3. Selects the thin devices from the middle pane.
4. Selects the desired metric from the bottom pane and displays the metric for the thin devices.
5. Observes metric for thin devices (Figure 231 on page 252).

Data devices

To display data device performance metrics:

1. Selects **Metrics** in the bottom pane.
2. Selects **Devices** from **Symmetrix** tree view in the top pane.
3. Selects the data devices from the middle pane.
4. Selects the desired metric from the bottom pane and displays the metric for the data devices.
5. Observes metric for data devices ([Figure 232 on page 253](#)).

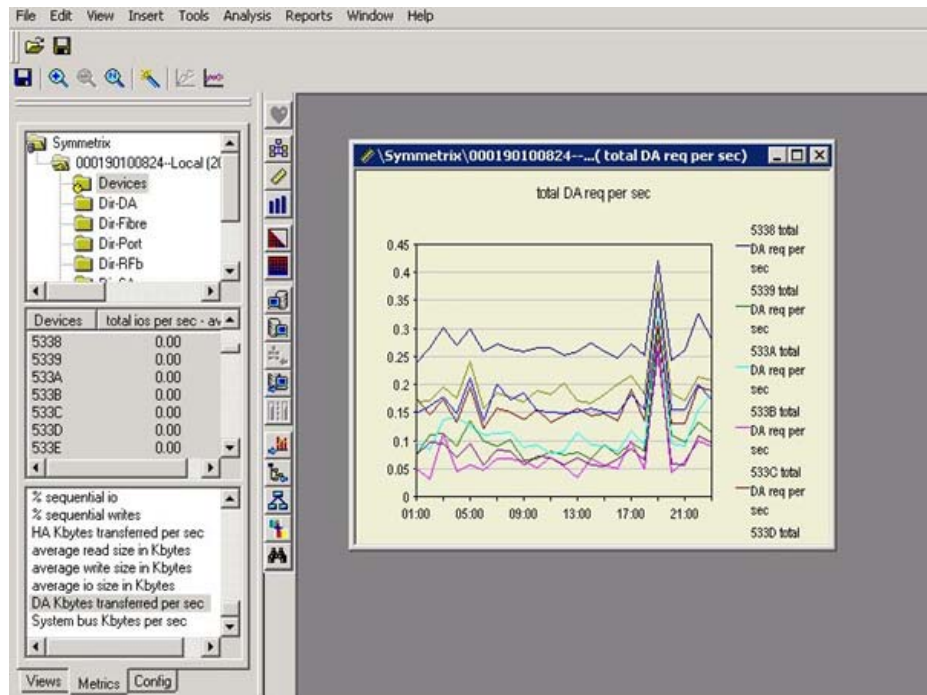


Figure 232 Performance Manager console displaying selected data device data

Back-end physical disks

To display physical disk performance metrics:

1. Selects **Metrics** in the bottom pane.
2. Selects **Disks** from **Symmetrix** tree view in the top pane.
3. Selects the disks from the middle pane.
4. Selects the desired metric from the bottom pane and displays the metric for the back-end physical disks.
5. Observes metric for back-end physical disks ([Figure 233 on page 254](#)).

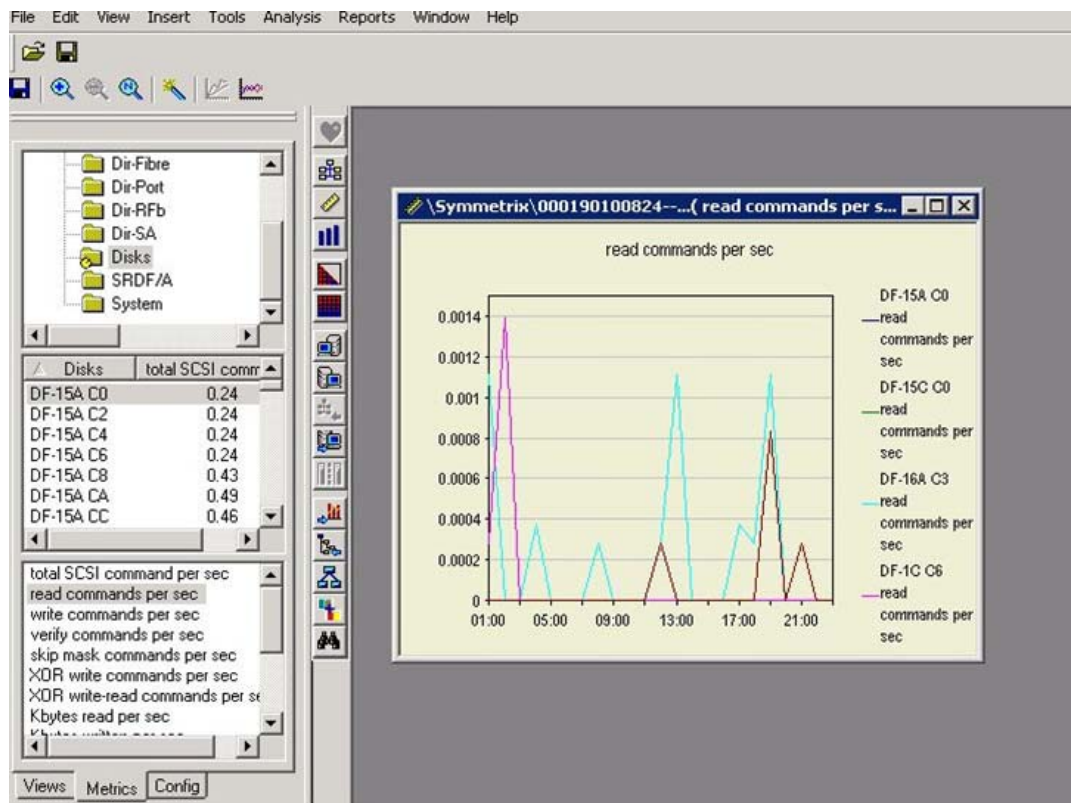


Figure 233 Performance Manager console displaying selected back-end disks

APPENDIX A

About Virtual Provisioning

EMC Ionix ControlCenter has extended its capabilities to perform Virtual Provisioning, also known as Thin Provisioning. This appendix discusses why datacenters should consider Virtual Provisioning, what it is, and how it works.

This appendix contains the following information:

- ◆ [Virtual Provisioning overview.....](#) 256
- ◆ [Virtual Provisioning glossary](#) 262

Virtual Provisioning overview

Why Virtual Provisioning

Businesses and organizations continually search for ways to both simplify storage management processes and improve storage capacity utilization. When provisioning storage for a new application, storage administrators must consider the application's future capacity requirements rather than simply its current requirements. In order to reduce the risk that the application will run out of data storage capacity, administrators have often allocated more physical storage to an application than is needed. This allocated but unused storage impacts utilization planning and introduces higher operational costs. In other cases, organizations do not allocate enough storage. Even with the most careful planning, they cannot accurately predict the application's data growth. Therefore, it is often necessary to provision additional storage in the future, which can potentially require an application outage. This is where Virtual Provisioning can address these challenges, as data devices can be added to a storage pool to meet the growing trend of applications without interrupting a host or application.

What is Virtual Provisioning

Virtual Provisioning builds on the base "thin provisioning" functionality, which is the ability to have a large "thin" device (volume) configured and presented to the host while consuming physical storage from a shared pool only as needed. There are two types of devices in Virtual Provisioning, thin devices (TDevs) and data devices. A thin device is the device that is configured to customer requirements. It does not have storage associated with it at first. A data device is an internal device that contains physical storage chunks that can be associated with "thin device extents," which are small units of storage. All data devices are organized into pools and are shown as System Allocated devices. A thin pool is a collection of data devices and TDevs that are bound together. Within a thin pool, TDevs that are mapped and masked to hosts are bound to data devices within the virtual pool. Data devices provide the actual storage used by the host. The thin pool can have data devices that are either "enabled" or "disabled." This feature is always useful for quick capacity growth or for a reserve of actual storage that can be reallocated to another thin pool.

How Virtual Provisioning works

Storage allocation operations are performed in thin device extents. A round-robin mechanism balances the allocation of data device extents across all of the data devices in the pool that are enabled and that have unused capacity. The initial bind of a thin device to a pool causes one thin device extent, or 12 tracks (768 KB), to be allocated per thin device. When a read is performed on a thin device, the data being read is retrieved from the appropriate data device in the storage pool to which the thin device is bound. Reads directed to an area of a thin device that has not been mapped do not trigger allocation operations. The result of reading an unmapped block is that a block in which each byte is equal to zero will be returned. When a write to a thin device is serviced, storage is allocated to the thin device from the data devices in the associated storage pool. When more storage is required, data devices can be added to existing thin storage pools. New thin devices can also be created and associated with existing thin pools.

It is possible for a thin device to be presented for host use before all of the reported capacity of the device has been mapped. It is also possible for the sum of the reported capacities of the thin devices using a given pool to exceed the available storage capacity of the pool. Such a thin device configuration is said to be “oversubscribed.”

Unbinding a thin device from a pool frees all the space that the thin device had consumed from that pool. The data cannot be recovered after the thin device is unbound.

Supported Symmetrix arrays

Virtual Provisioning is supported in EMC Ionix ControlCenter 6.1 for Symmetrix DMX-3 or DMX-4 storage arrays with Enginuity 5773 or Symmetrix V-Max storage arrays with Enginuity 5874. It requires the Symmetrix Management Console (SMC) version 6.1 or later and Solutions Enabler 6.5.0 or later.

Graphical representations of Virtual Provisioning are shown in [Figure 234](#) and [Figure 235](#).

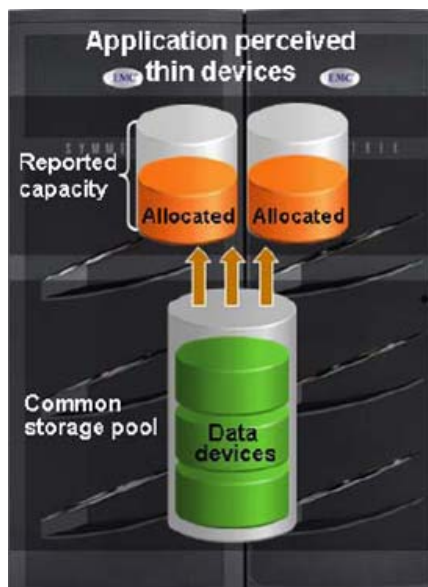


Figure 234 High-level representation of Virtual Provisioning

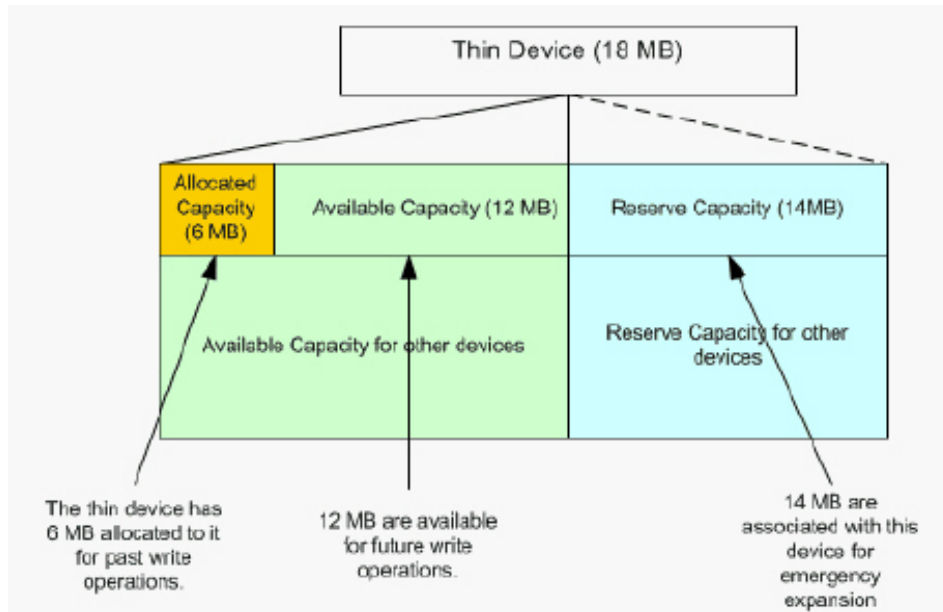


Figure 235 Thin device relationship to storage pool devices

Benefits of Virtual Provisioning and the role of Ionix ControlCenter

Virtual Provisioning creates new benefits and new challenges for storage management. When managed properly, Virtual Provisioning can provide dynamic changes in how capacity utilization is managed and provisioned.

Before Virtual Provisioning, metavolumes were used to stripe data over many physical disks. Virtually provisioned devices are automatically wide striped over many disks. Wide striping can improve performance for some application workloads. In addition, virtually provisioned devices can be oversubscribed, creating new dynamics for host storage provisioning. Administrators can allocate a volume size to a host in excess of the actual storage provided to the virtually provisioned environment. Virtual Provisioning provides storage administrators with more flexibility to be generous with advertised storage, while still maintaining high utilization rates.

Virtual Provisioning can improve storage capacity utilization and simplify storage management by presenting the application with sufficient capacity for an extended period of time, reducing the need to frequently provision new storage and avoiding the cost of allocated but unused storage.

Ionix ControlCenter extends the same advanced storage management capabilities to virtually provisioned Symmetrix devices that it provides to other EMC arrays and third-party storage arrays. These capabilities include: Ionix ControlCenter Console centralized roll-up of an entire enterprise data center, storage provisioning, performance analysis, comprehensive reporting, and overall health monitoring.

Considerations for Implementing Virtual Provisioning

Virtual Provisioning provides datacenters with capability to dynamically manage capacity utilization, however it is important to understand what may negatively affect the thin pool and what monitoring is needed as follows:

- ◆ Storage pool needs to be monitored carefully to avoid running out of space, causing an application failure and requiring a data restore.
- ◆ Oversubscription must be monitored and managed as it does allow the possibility of a host running out of available storage.
- ◆ Careful selection of which servers, applications, and devices are going to effectively share the pool to avoid spindle contention between I/O-sensitive applications.
- ◆ It is important to understand an application's behavior to determine the consumed space that cannot be reclaimed. Many file systems do not efficiently reuse the space associated with deleted files. Some databases pre-allocate space and format it. As a result, unnecessary space is allocated in a thin pool, reducing the capacity utilization benefits.

Therefore, when implementing Virtual Provisioning, new operational procedures need to be established to ensure that storage is available and provisioned before a host runs out of available storage. Ionix ControlCenter makes these tasks not only possible, but easy.

Performance implications of Virtual Privisioning

The performance implications for the use of thin devices depends on the nature of the workload and the state of the thin device. In a thin device implementation, there are response time and throughput overheads that are incurred the first time a write is performed on an unallocated region of a thin device. The back-end layout of the thin device tends to be widely striped, typically spanning a much greater number of drives than a regular device. This makes it easier to keep the workload balanced across many physical spindles, which can improve performance for the random read and write workloads.

Virtual Provisioning glossary

High level terminology

Virtual Provisioning

EMC's corporate term for thin provisioning.

Storage Pool

Umbrella term for storage pools used by virtual architectures.

Commonly used terminology

Thin Device

Host accessible device that has no storage directly associated with it, referred to as a TDev.

Device

Logical unit of storage defined within an array.

Data Device

Internal device that provides storage capacity to be used by thin devices.

Thin pool

Collection of data devices and TDevs that is linked to host visible logical devices, and is dynamically allocated as needed.

Bind

Associating one or more thin devices with a thin pool.

Unbind

Disassociating one or more thin devices from a thin pool.

Thin pool terminology

Thin Pool Total Capacity

Total (writeable) size of the thin pool, excluding the overhead associated with RAID, mapping, binding, etc.

Thin Pool Raw Capacity

Total size of the thin pool, including the overhead associated with RAID, mapping, binding, and reserve capacity.

Thin Pool Available Capacity

Amount of storage in the thin pool that can be allocated.

Thin Pool Allocated Capacity

Amount of storage in the pool that has been allocated to thin devices.

Thin Pool Oversubscribed Capacity

Difference between the stated size of all thin devices and the capacity of the thin pool.

Thin Pool Reserve Capacity

Capacity of the thin pool that is reserved for use when the normal (unreserved) capacity is consumed.

Thin Pool Reserve Total Capacity

Amount of capacity in the thin pool set aside for reserve allocations.

Thin Pool Reserve Available Capacity

Amount of reserve capacity in the thin pool available for use by thin devices.

Thin Pool Reserve Allocated Capacity

The capacity in the reserve portion of the thin pool that has been allocated to thin devices.

Thin device terminology

Thin Device Subscribed Capacity

The size of the thin device, as seen by the host.

Thin Device Allocated Reserve Capacity

The amount of reserve storage that has been used by a thin device.

Thin Device Allocated Capacity

The capacity that has been withdrawn from the thin pool for the exclusive use of this thin device.

Alert and threshold terminology

Thin Pool - % Allocated

A threshold point at which an alert may be sent and the administrator may take actions to ensure that sufficient thin pool storage is available.

Thin Pool Reserve - % Allocated

A threshold point at which an alert may be sent and the administrator may take actions to ensure that sufficient thin pool reserve storage is available.

Thin Device - % Allocated

The expression of Thin Device Allocated Capacity as a percentage.

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